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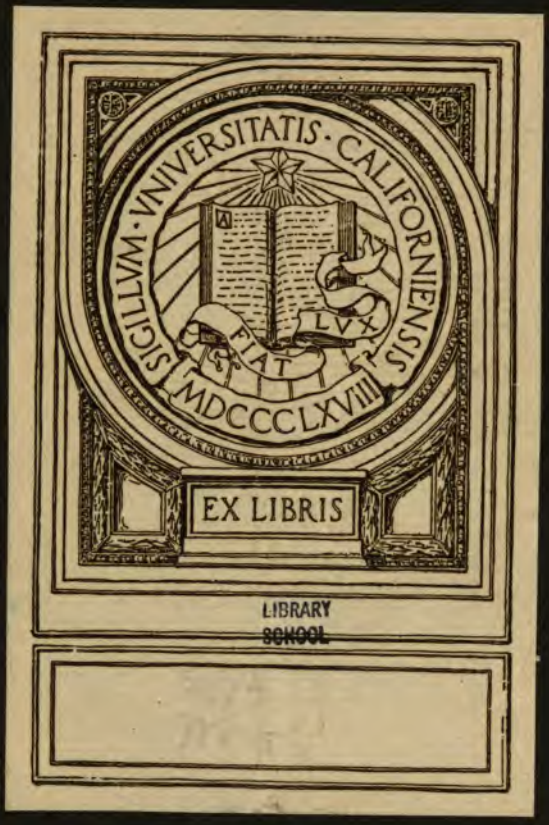

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DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

GEORGE OTIS SMITH, DIRECTOR

SUGGESTIONS TO AUTHORS

OF

PAPERS SUBMITTED FOR PUBLICATION BY THE UNITED STATES GEOLOGICAL SURVEY

WITH

DIRECTIONS TO TYPEWRITER OPERATORS

BY

GEORGE McLANE WOOD

EDITOR

REVISED EDITION

WASHINGTON

GOVERNMENT PRINTING OFFICE

1913

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NOTE.

The first pamphlet containing suggestions to authors for the preparation of manuscript intended for publication by the Geological Survey was published in January, 1888. This pamphlet was revised and reprinted in 1892. In 1904 the Survey published suggestions for the preparation of geologic folios, and in 1906 suggestions for the preparation of reports on mining districts. All matter of present value that was included in these publications, with much additional material, has been incorporated in the pamphlet here presented. The first edition of this pamphlet was published in 1909. The edition now published contains some new material and discusses in greater detail several suggestions that were made in the first edition. In the compilation of both editions valuable aid has been rendered by Mr. Bernard H. Lane, assistant editor.

G. M. W.

JULY, 1913.

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SUGGESTIONS TO AUTHORS.

CLASSES OF PUBLICATIONS.

The publications of the Geological Survey consist, besides topographic maps and miscellaneous circulars and pamphlets, of (*a*) annual reports, relating chiefly to administrative affairs; (*b*) monographs, exhaustive treatises on restricted or special subjects; (*c*) professional papers, mainly of a technical character, adapted to larger illustrations than can be conveniently put into bulletins; (*d*) bulletins, the most numerous class, comprising all papers not assigned to one of the other classes; (*e*) water-supply papers; (*f*) annual statistical volumes on mineral resources; and (*g*) geologic folios. If it seems doubtful whether a particular paper should be published in one or another of these classes, the author may make a recommendation, and the chief of branch, when he transmits a paper, will state the class in which it should be published.

COURSE OF MANUSCRIPTS.

Every paper should be transmitted to the Director by the chief of the branch in which it originated, whose recommendation for publication will be regarded as an approval of the paper from a scientific or technical point of view. If a paper originating in one branch, say the water resources, contains matter pertaining to the work of another branch, say the geologic, the chief under whom the paper originated should, before transmitting it to the Director, refer it to the chief of the other branch for approval (after revision if necessary) of the portion germane to the work of his branch.

When a manuscript is received it will be referred to the editor, who, after giving it a preliminary examination and ascertaining that it is complete in form and ready for his action, will lay it before the Director for his personal consideration. When the Director approves the paper for publication he will return it to the editor for critical examination and preparation for printing.

The final editorial work is largely literary and typographic in character. It includes suggestions to the author concerning the correction of faults or errors in grammar or rhetoric, in paragraphing, or in arrangement of matter—in short, suggestions affecting correctness, clearness, and conciseness of expression. It comprises also the examination of many other details, such as the character and grada-

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tion of headings, the form of footnotes, the use of geographic and geologic names, the form of tables and sections, and the various minutiæ of printing, including sizes and styles of type, capitalization, punctuation, spelling, and other features of typographic style. The determination of many of these details is made in accordance with prescribed rules, such as those of the Government Printing Office Style Book, or mandatory decisions, such as those of the United States Geographic Board or of the Survey's committee on geologic names.

After editorial revision the manuscript will be returned to the author whenever practicable, in order that he may examine the suggestions or corrections made. If any of the editorial changes seem to him to be inadvisable, he should confer or correspond with the editor and endeavor to reach an agreement without delay. If the edited manuscript is acceptable to the author, he need only write his initials and the date on the back of the title-page.

FORM AND FEATURES OF MANUSCRIPT.

METHOD OF WRITING.

It is bad practice, especially for young writers, to dictate offhand from field notes, with the intention of rearranging and polishing the typewritten material thus obtained to form a final report. Reports prepared in this way almost invariably bear indications of slovenly work. As far as possible, the final writing should be preceded by a complete study of material. This study should include examinations of specimens and samples collected and the preparation of maps, sketches, and photographs for illustrations. During this preliminary study notes and memoranda should be made in such form that they can be sorted and classified under the different subject heads adopted.

THE BEST PRINTER'S "COPY."

The best "copy" for the printer is typewritten matter on letter paper (sheets about 8 by 10½ inches) of ordinary thickness. Thin "manifold" paper should not be used. If two copies of the manuscript are made, the original (not the carbon) should be transmitted. All the sheets should be of uniform size and the typewriting should be on only one side of the paper, in lines rather widely spaced, not "solid." The practice of pasting sheets together to form a sheet or strip that is longer than letter paper and then folding it to letter size is objectionable. It is not important that every sheet should be completely filled with writing. Room for wide tables can be obtained by pasting additional sheets at the side only, but this plan should not be employed for additions to the text. Copy for tables should not be crowded, and it is not necessary that the whole of a table

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should appear on one sheet. Matter for bibliographies or other similar works may be written on cards, and in some papers large sheets bearing tables or geologic columns will be accepted as copy.

Just before the manuscript is transmitted, after all inserts and additions have been made, the pages should be numbered consecutively from beginning to end. Manuscript should not be folded or rolled, but should be kept "flat" and transmitted in a secure envelope or cover. Drawings or photographs that are intended for use as illustrations should be kept distinct from the manuscript, not inserted in it, but should generally be transmitted at the same time.

GENERAL FORM.

Before preparing a paper for publication an author should, by examining the Survey's printed reports, familiarize himself with the details of their form, many of which are set forth herein. He should at the outset carefully consider the arrangement or order of presentation of the matter of his paper. Special suggestions as to the preparation of geologic folios and of reports on mining districts are presented on pages 29–41 and will be serviceable in indicating the proper treatment in many papers of other kinds. They are, of course, only supplemental to the suggestions given in the first part of this pamphlet, which apply to all Survey publications.

The title of a paper should be brief—as brief as it can be made—and, with the name of the author, should appear not only on the title-page, but at the top of the first page of the text.

Each paper should include a preface by the chief of the division or section in which it originated, a summary of its important results or conclusions, and a short bibliography of the subject discussed.

CONCISENESS OF STATEMENT.

The author should express his meaning clearly and concisely and should avoid unnecessary repetition. Direct, simple statement of facts is more to be desired than rounded periods, rhetorical flourishes, or studied originality of expression. An author can avoid unnecessary repetition only by logically subdividing his material under proper heads before commencing the final writing.

On the other hand, a certain kind of repetition is permissible and even desirable. Thus each chapter or major subdivision of a report should be fairly complete within itself—that is, if necessary, it should contain very brief statements of the main conclusions reached in other chapters, so that the reader may, if he desires, be able to read that chapter understandingly without reference to other chapters. Therefore, instead of saying that "this point is explained in another part of the report," it is better to state briefly the explanation, which

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can generally be presented in but few more words than are required for the reference, thus saving the reader much time and annoyance.

TABLE OF CONTENTS AND LIST OF ILLUSTRATIONS.

The manuscript should include a table of contents (headed "Contents") and a list of illustrations (headed "Illustrations"). The table of contents should be a transcript of the headings appearing in the manuscript, so arranged as to show their relations—their coordination and subordination. The table of contents given below shows the approved method of indicating (by indention) the rank and relations of the headings that appear in the text.

CONTENTS.

	Page of manuscript.
Introduction	1
Location and area of the region	1
Outline of the geography and the geology	2
Topography	5
Relief	5
Drainage	8
Descriptive geology	11
Stratigraphy	11
Sedimentary rocks	11
Igneous rocks	20
Metamorphic rocks	24
Structure	26
Geologic history	32
Sedimentary record	32
Igneous record	34
Physiographic record	35
Mineral resources	36
Coal	36
Building stone	38
Iron ore	39
Water resources	40
Index	43

The page numbers indicated above should be those that have been finally assigned after the manuscript is complete.

Suggestions in regard to the list of illustrations are given on page 26, under the heading "Illustrations." This list, like the table of contents, should be filled out with manuscript page numbers.

HEADINGS.

It is undesirable and generally unnecessary to provide headings of more than four or five grades. Excessive refinement in subdividing the text of a paper is confusing rather than enlightening to the reader. The headings of the lowest grade are as a rule italic side headings, the others are center headings. Only a small amount of text—not more

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than a page, or at the most two pages—should be covered by a side heading. In the text or body of the paper the rank of the center headings will be shown by printing them in distinctive faces of type, properly graded as to size. It is not necessary to prefix numbers or letters to headings, either in the table of contents or in the text. All coordinate or similar groups of matter should be provided with headings of similar rank, and no group or part should be left without a suitable heading. A proper scheme of headings is essentially a rational classification of the material embodied in the paper, as may be seen by reference to the specimen table of contents given above. It is preferable that the text be complete in itself, independent of the headings, so that it will be perfectly intelligible even if read without them. Each heading should contain a substantive. The use of adjectives alone for headings (as "Topographic," "Geologic," "Historical") is undesirable.

Headings should preferably indicate the thing or things described or discussed in the text, not the text itself. The italicized words in the following quoted headings are superfluous: "*Description of the* Cretaceous rocks," "*Discussion of* ore deposits," "*Statement of theories of* origin of the ore," "*Description of* the mines," "*Table showing* production of lead in 1912." Headings like "Introduction" and "Summary" are exceptions to this rule, but some reports contain too many headings of this kind, especially "Introduction," which stands over numerous subordinate groups of paragraphs in the body of many reports and can with advantage be replaced by headings denoting the features considered in the text beneath them.

PARAGRAPHING.

An author should carefully consider the paragraphing of a paper before submitting it for publication and should clearly indicate all paragraphs. Faulty paragraphing is expensive to correct in proof and its correction may introduce new errors.

FIRST OR THIRD PERSON AND USE OF "WE."

A paper may be prepared in either the first or the third person, but both "I" (or "we") and "the writer" should not be used indiscriminately. Many reports may advantageously be written in impersonal form. The "editorial we," used in newspapers in the sense of "I," should not be employed. The habitual use of "we" exemplified in the following sentence should also be avoided: "If with these streams *we* include Deep and Clear creeks *we* have a group of gold-producing streams that flow from what *we* have seen to be the chief area of mineralization." Better "Deep and Clear creeks and the other creeks just mentioned form a group of gold-producing streams that flow from the chief area of mineralization."

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CROSS REFERENCES.

The use of numerous cross references is not desirable. References to "another part of this paper" or "a subsequent connection" are especially undesirable. It is better to cite the heading over the matter to be indicated or to restate briefly the facts to which allusion is made. References to pages by number may be necessary, but page numbers can be supplied only when the paper has reached the stage of page proof. The number of such references should be reduced to a minimum.

TABLES.

Every table, geologic section or column, and chemical analysis should be provided with a concise heading. The name of the analyst (with initials) should be given in connection with an analysis. If tables must be numbered, arabic numerals should be used, as Table 1 (not Table I, nor Table No. 1).

The proper arrangement of tables is dependent on many factors and may be difficult. Few general rules can be given, and if a table is complicated or the author is in doubt as to its form he should consult the editor before finally preparing it.

Well or drill-hole records should appear in the following form:

Record of Winters well, Southwest City, Mo.

	Thickness.	Depth.
	Feet.	*Feet.*
Surface and coarse rock	48	48
Blue flint	30	78
Light-gray rock	20	98
Dark-brown flint	12	110

In tables of analyses use 1, 2, 3, etc., over the columns (not I, II, III). The term "per cent" is not necessary above the figure column. If chemical constituents are denoted by both words and symbols the symbols should be written between parentheses, as "Silica (SiO_2)," "Alumina (Al_2O_3)."

The word "Total" should be omitted before the footing in any table where the numbers are obviously totals.

In sections use "Feet" or "Ft. in." over the figures.

GEOLOGIC NAMES.

All geologic names must be approved by the Survey's committee on geologic names before they can be printed in a publication of the Survey. As it is necessary to obtain that committee's approval of the particular use in any paper of names of members, formations, groups,

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series, systems, epochs, and periods, even if only a casual reference is made, the committee must examine the manuscript and also such illustrations as bear geologic names. This examination must be made *before* the paper is transmitted for publication, and the author must procure from the committee a letter containing a list of the names used and indicating the action taken on them, to be transmitted with the manuscript. A few of the general decisions of the committee are given here.

The following is a table of accepted names for eras, periods or systems, and epochs or series:

Geologic eras, periods, systems, epochs, and series.

Era.	Period or system.	Epoch or series.
Cenozoic	Quaternary	Recent. Pleistocene (replaces "Glacial").
	Tertiary	Pliocene. Miocene. Oligocene. Eocene.
Mesozoic	Cretaceous	Upper (Gulf may be used provincially). Lower (Comanche and Shasta may be used provincially).
	Jurassic	Upper. Middle. Lower.
	Triassic	Upper. Middle. Lower.
Paleozoic	Carboniferous	Permian. Pennsylvanian (replaces "Upper Carboniferous"). Mississippian (replaces "Lower Carboniferous").
	Devonian	Upper. Middle. Lower.
	Silurian.	
	Ordovician	Upper (Cincinnatian may be used provincially). Middle (Mohawkian may be used provincially). Lower.
	Cambrian	Saratogan (or Upper Cambrian). Acadian (or Middle Cambrian). Waucoban (or Lower Cambrian).
Proterozoic	Algonkian, Archean (pre-Cambrian).	

The following names, if used in a titular sense, are permissible only when put in quotation marks:

"Coal Measures" (subdivision of the Carboniferous).
"Calciferous" (subdivision of the Ordovician).
"Corniferous."
"Juratrias."
"Lignitic."
"Magnesian" (subdivision of the Ordovician).
"Permo-Carboniferous."
"Red Beds" (Permian and Triassic rocks of the West).

The foregoing decisions are not intended to preclude the use as common nouns or adjectives of coal measures, calciferous, lignitic, magnesian, and red beds. Use the forms glacial, preglacial, postglacial.

The adjectives upper, middle, and lower, when used with Carboniferous, Tertiary, or Quaternary, should not be capitalized unless the

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term is quoted. When used with the names of other systems they may be capitalized if the term is used in a definite sense. When applied to subdivisions of series or to indefinite or local subdivisions of stratigraphic units they should not be capitalized. Examples: Upper Cambrian; Upper Cretaceous; Lower Devonian; Mississippian ("Lower Carboniferous"); middle Miocene; lower Colorado.

GEOGRAPHIC NAMES.

In the spelling of geographic names preference will be given to (1) decisions of the United States Geographic Board, (2) atlas sheets of the United States Geological Survey (latest editions), (3) reports of the Census of the United States, (4) United States Postal Guide, (5) United States Land Office maps, (6) Century Atlas of the World and Century Dictionary of Names.

Names whose form is doubtful may be submitted to the Geographic Board for determination.

HYPHENS IN PETROGRAPHIC TERMS.

The Survey has adopted a uniform scheme for the use of hyphens in petrographic terms, based on the single principle that like names are connected by a hyphen and unlike names are not. The names used in such terms are of four classes—(*a*) rock names, (*b*) mineral names, (*c*) textural names, and (*d*) names expressing the kind of clastic aggregation. Any two or more names of either class are connected by a hyphen; others are not. The principal names of classes *c* and *d* are as follows: (*c*) Felsophyre, gneiss, porphyry, schist, vitrophyre; (*d*) agglomerate, breccia, conglomerate, sand, tuff.

The subjoined list is not complete but will serve to illustrate the principle. To avoid confusion, a term that, according to this principle, is not hyphenated should remain without the hyphen when it becomes a compound adjective modifying some other word—for example, bostonite porphyry, bostonite porphyry dike.

actinolite-magnetite schist
acmite trachyte
adamellite gneiss
ægirite-augite
ægirite granite
ægirite granite porphyry
alaskite porphyry
albite diorite
albite schist
alkali syenite porphyry
amphibole-biotite granite
amphibole granite
amphibole picrite
analcite basalt
andalusite hornfels
andalusite schist
andesite-basalt
andesite breccia
andesite vitrophyre
anorthite andesite
apatite syenite
augite andesite porphyry
augite-biotite andesite
augite-bronzite andesite
augite diorite
augite-hornblende gabbro
augite latite
augite-mica syenite

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augite-microcline granite
augite monzonite
augite peridotite
barium feldspar
basalt tuff
biotite-augite latite
biotite diorite
biotite gneiss
biotite-hornblende-quartz latite
biotite-pyroxene andesite
biotite-quartz monzonite
biotite rhyolite
biotite schist
biotite tinguaite
bostonite porphyry
breccia-agglomerate
breccia-conglomerate
bronzite norite
bronzite-olivine aleutite
cancrinite syenite
chiastolite schist
clay shale
clay slate
cordierite andesite
cordierite hornfels
cordierite norite
corundum anorthosite
corundum pegmatite
dacite tuff
diabase-gabbro
diabase porphyry
diopside hornstone
diorite-gabbro
diorite porphyry
diorite schist
enstatite diabase porphyry
epidote-chlorite schist
essexite porphyry
feldspar porphyry
felsite tuff
gabbro-diabase
gabbro-diorite
gabbro porphyry
gabbro-pyroxenite
gabbro-syenite
garnet norite
glaucophane schist
granite-diorite
granite gneiss
granite-monzonite
granite-syenite porphyry
greenstone conglomerate
greenstone schist
grünerite-magnetite schist
haüyne phonolite
hornblende andesite
hornblende andesite agglomerate
hornblende andesite porphyry
hornblende-augite andesite
hornblende gneiss
hornblende granite
hornblende-mica andesite
hornblende-mica diorite
hornblende-mica granite
hornblende peridotite
hornblende porphyry
hornblende-pyroxene-biotite-quartz latite
hornblende-quartz andesite
hypersthene-augite andesite
hypersthene gabbro
ilmenite norite
keratophyre tuff
labradorite-bytownite
labradorite porphyry
latite-andesite
latite-phonolite
lava breccia
leucite absarokite
leucite basalt
leucite basanite
leucite granite porphyry
leucite tephrite
leucitite tuff
lime feldspar
lime-soda feldspar
lithia mica
magnesia mica
magnetite gabbro
melaphyre tuff
melilite basalt
melilite monchiquite
melilite-nephelite basalt
mica dacite
mica diorite
mica diorite porphyry
mica gabbro porphyry
mica gneiss
mica-hornblende norite
mica hornblendite
mica peridotite
mica schist
monzonite porphyry
muscovite mica
natrolite phonolite
nepheline basalt
nepheline-melilite basalt
nephelite basalt

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nephelite basanite
nephelite felsite
nephelite syenite porphyry
nosean-leucite tephrite
nosean sanidinite
oligoclase feldspar
olivine andesite
olivine-augite andesite
olivine diabase
olivine melaphyre
orthoclase feldspar
orthoclase gabbro
orthoclase gabbro-diorite
picrite porphyry
plagioclase basalt
plagioclase feldspar
plagioclase gneiss
porphyry tuff
potash feldspar
pseudoleucite syenite
pyroxene andesite breccia
pyroxene-biotite andesite
pyroxene-mica andesite
pyroxene porphyry
quartz-augite diorite
quartz-augite syenite
quartz-biotite-garnet gneiss
quartz diorite gneiss
quartz diorite porphyry
quartz gneiss
quartz-hornblende-mica monzonite
quartz keratophyre
quartz-mica-hornblende diorite
quartz-mica latite
quartz monzonite
quartz monzonite gneiss
quartz monzonite porphyry
quartz norite
quartz norite gneiss
quartz porphyry
quartz porphyry tuff
quartz-pyroxene diorite
quartz schist
quartz syenite porphyry
quartz-tourmaline porphyry
quartz trachyte
rhyolite-dacite
rhyolite-latite
rhyolite porphyry
saussurite gabbro
sericite schist
soda feldspar
soda granite
soda-lime feldspar.
soda microcline
soda minette
soda orthoclase
sodalite porphyry
sodalite syenite
sodalite tephrite
syenite-diorite porphyry
syenite felsophyre
syenite-monzonite
syenite porphyry
talc schist
tephrite tuff
theralite porphyry
tourmaline-biotite schist
tourmaline granite
tourmaline porphyry
trachyte-andesite
trachyte tuff
tridymite trachyte
tuff-agglomerate
tuff-breccia
uralite diorite
uralite porphyry
zoisite-hornblende diorite

PERSONAL TITLES.

Titles of honor, office, distinction, or address (such as Dr., Prof., Mr.) should be used only where the mention is personal, as in acknowledgment of courtesies or services. Such titles should be omitted from the names of authors cited and, if first name or initials are given, from names of coauthors or scientific collaborators. In personal mention of a member of the Survey use "Mr."

Mr. G. W. Jefferson kindly guided the writer to the place.
Van Hise says * * *
George Otis Smith's work on * * *
The economic geology is discussed by Mr. Ransome in part 2.
Analyst, W. F. Hillebrand. This rock was analyzed by Dr. Hillebrand.
The fossils were identified by Mr. Stanton.

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CHEMICAL TERMS AND SYMBOLS.

The preferred chemical terms relating to valency are univalent, bivalent, trivalent, quadrivalent, quinquivalent—not monovalent, divalent, tervalent, tetravalent, pentavalent.

Write columbium, columbic, columbate—not niobium, niobic, niobate. Write glucinum, glucina—not beryllium, beryllia. Write aluminum (uniform with alumina)—not aluminium.

The following list of chemical elements and symbols is taken from the annual report of the international committee on atomic weights, 1913.

Chemical elements and symbols.

Element.	Symbol.	Element.	Symbol.	Element.	Symbol.
Aluminum	Al	Holmium	Ho	Rhodium	Rh
Antimony	Sb	Hydrogen	H	Rubidium	Rb
Argon	A	Indium	In	Ruthenium	Ru
Arsenic	As	Iodine	I	Samarium	Sa
Barium	Ba	Iridium	Ir	Scandium	Sc
Bismuth	Bi	Iron	Fe	Selenium	Se
Boron	B	Krypton	Kr	Silicon	Si
Bromine	Br	Lanthanum	La	Silver	Ag
Cadmium	Cd	Lead	Pb	Sodium	Na
Cæsium	Cs	Lithium	Li	Strontium	Sr
Calcium	Ca	Lutecium	Lu	Sulphur	S
Carbon	C	Magnesium	Mg	Tantalum	Ta
Cerium	Ce	Manganese	Mn	Tellurium	Te
Chlorine	Cl	Mercury	Hg	Terbium	Tb
Chromium	Cr	Molybdenum	Mo	Thallium	Tl
Cobalt	Co	Neodymium	Nd	Thorium	Th
Columbium	Cb	Neon	Ne	Thulium	Tm
Copper	Cu	Nickel	Ni	Tin	Sn
Dysprosium	Dy	Niton	Nt	Titanium	Ti
Erbium	Er	Nitrogen	N	Tungsten	W
Europium	Eu	Osmium	Os	Uranium	U
Fluorine	F	Oxygen	O	Vanadium	V
Gadolinium	Gd	Palladium	Pd	Xenon	Xe
Gallium	Ga	Phosphorus	P	Ytterbium (Neoytterbium)	Yb
Germanium	Ge	Platinum	Pt	Yttrium	Y
Glucinum	Gl	Potassium	K	Zinc	Zn
Gold	Au	Praseodymium	Pr	Zirconium	Zr
Helium	He	Radium	Ra		

QUOTATIONS AND REFERENCES.

Responsibility for the accuracy of references and quotations must rest with the author; they will not usually be verified in the editorial revision. In reprinted matter the exact words of the original should be preserved, but it is not necessary to reproduce typographic errors or details of printer's style, such as spelling, capitalization, and punctuation, except in extracts in which, for obvious reasons, quaintness of form should be preserved. Omissions in quoted matter should be indicated by stars.

Examination of the original sources of many unintelligible quotations has shown that numerous errors are made in copying printed matter. The typewritten copy of every extract or quotation should be carefully compared with the original.

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FOOTNOTES.

Before making a footnote an author should carefully consider whether the matter does not belong in the text. Proper footnotes consist chiefly of references to the literature of the subject discussed. For reference marks in the text superior figures (^{1}, ^{2}, ^{3}) should be used, and each footnote should be written immediately below the line in which the reference mark appears and be separated from the text above and below by lines. For reference marks in a table superior underscored letters ($\underline{^a}$, $\underline{^b}$, $\underline{^c}$), to be printed as italic superiors (^{a}, ^{b}, ^{c}), should be used, and the footnotes should be written at the bottom of the table.

Personal names, unless the persons are well known, should include initials, to make identification certain, especially for indexing. The initials need not be given in the text; they may appear in the footnotes.

According to the general American practice a single initial is not used in a personal name: John Smith, not J. Smith, but J. W. Smith (or Smith, J. W.).

Standard forms of footnotes are given below. The capitalization, abbreviation, punctuation, etc., should be noted and followed.

Gilbert, G. K., Recent earth movement in the Great Lakes region: U. S. Geol. Survey Eighteenth Ann. Rept., pt. 2, p. 639, 1898.

Van Hise, C. R., A treatise on metamorphism: U. S. Geol. Survey Mon. 47, p. 697, 1904.

Lindgren, Waldemar, The Tertiary gravels of the Sierra Nevada of California: U. S. Geol. Survey Prof. Paper 73, p. 44, 1911.

Shaler, N. S., The geology of Nantucket: U. S. Geol. Survey Bull. 53, pp. 42–47, 1889.

Leighton, M. O., and Tavernier, René, The public utility of water powers and their governmental regulation: U. S. Geol. Survey Water-Supply Paper 238, p. 75, 1910.

Hayes, C. W., U. S. Geol. Survey Geol. Atlas, Pikeville folio (No. 21), p. 3, 1895.

Emmons, S. F., Progress of the precious-metal industry in the United States since 1880: U. S. Geol. Survey Mineral Resources, 1892, pp. 46–94, 1893.

McGee, W J, Soil erosion: U. S. Dept. Agr. Bur. Soils Bull. 71, 1911.

Chamberlin, T. C., The diversity of the glacial period: Am. Jour. Sci., 3d ser., vol. 45, pp. 171–200, 1893.

Irving, R. D., The copper-bearing rocks of Lake Superior: Science, vol. 1, pp. 140–141, 1883.

Becker, G. F., Schistosity and slaty cleavage: Jour. Geology, vol. 4, p. 445, 1896.

Brooks, A. H., Applied geology: Washington Acad. Sci. Jour., vol. 2, pp. 43–44, 1912.

Branner, J. C., The phosphate deposits of Arkansas: Am. Inst. Min. Eng. Trans., vol. 26, p. 584, 1896.

Willis, Bailey, Oil of the northern Rocky Mountains: Eng. and Min. Jour., vol. 72, pp. 782–784, 1901.

Tarr, R. S., and Von Engeln, O. D., A laboratory manual of physical geography, p. 312, 1910.

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The forms given below should be used. The words in parentheses explain the abbreviations and are not to be used.

Abh. (Abhandlung)
Acad., Akad. (academy, Akademie)
Agr. (agriculture, agricultural)
Am. (American)
America
Anal. (analytical, analytische)
Annals, Annales
Ann. (annual)
Assoc. (association)
Beitr. (Beiträge)
Ber. (Berichte)
Biol. (biologic)
Bot. (botanical)
Bull., Bol. (bulletin, boletín)
Bur. (bureau)
Chem. (chemical, chemische, chemiker)
Chemistry, Chemie
Circ. (circular)
Coll. (college)
Cong. (congress)
Contr. (contributions)
Dept. (department)
Econ. (economic)
Eng. (engineers, engineering)
Gazette
Geog. (geographic, geographische)
Geography, Geographie, géographie
Geol. (geologic, geologische)
Géol. (géologique)
Geology, Geologie, géologie
Gesell. (Gesellschaft)
Hist. (historical, history)
Inst. (institute, institution)
Jahrb. (Jahrbuch)
Jahresb. (Jahresbericht)
Jour. (journal)
Lab. (laboratory)
Mag. (magazine)
Math. (mathematical)
Mem. (memoir)
Min. (mining, mineralogische)
Mitt. (Mitteilungen)
Mon. (monograph)
Monthly
Mus. (museum)
Nat. (natural, national)
Naturalist
Paper
Philos. (philosophical)
Proc. (proceedings)
Prof. (professional)
Pub. (publication)
Quart. (quarterly)
Rept. (report)
Rev. (review, revue)
Roy. (royal)
Sci. (science, scientific)
Science (the journal so named)
Soc. (society, société, etc.)
Survey
Tech. (technical, etc.)
Trans. (transactions)
Univ. (university)
Verh. (Verhandlungen)
Zeitschr. (Zeitschrift)
Zeitung

The following list shows the abbreviations of names of some well-known publications and publishing organizations. Names of countries, States, and cities and other proper nouns are written in full. The usage of foreign languages in regard to capitalization is followed, except that a capital is used in the abbreviation of the first word of a society's name.

Acad. Nat. Sci. Philadelphia
Allg. chem. Mineralogie
Allg. Jour. Chemie
Am. Acad. Arts and Sci.
Am. Assoc. Adv. Sci.
Am. Geog. Soc.
Am. Geologist
Am. Inst. Min. Eng.
Am. Jour. Sci., 4th ser. (Give series.)
Am. Mus. Nat. Hist.
Am. Naturalist
Am. Philos. Soc.
Am. Soc. Civil Eng.
Annales chim. et phys.
Annales des mines
Annals and Mag. Nat. Hist.
Arch. sci. phys. nat.
Assoc. Eng. Soc.

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Astrophys. Jour.
Boston Soc. Nat. Hist.
Canadian Min. Jour.
Canadian Min. Rev.
Canadian Rec. Sci.
Carnegie Inst. Washington
Centralbl. Mineralogie
Chem. Zeitung
Cincinnati Soc. Nat. Hist
Coll. Sci. Japan
Colorado Min. Bur.
Colorado Sci. Soc.
Cong. géol. internat.
Deutsche geol. Gesell.
Econ. Geology
Elisha Mitchell Sci. Soc.
Eng. and Min. Jour.
Eng. Mag.
Franklin Inst.
Gazz. chim. ital.
Geog. Jour.
Geol. Centralbl.
Geol. Fören.
Geol. Mag.
Geol. Soc. America
Geol. Soc. London
Gesell. Erdkunde Berlin
Illinois State Lab. Nat. Hist.
Indiana Dept. Geology and Nat. Res.
Inst. geol. México
Inst. Min. and Met.
Inst. Min. Eng. (England)
Jahresb. Chemie
Jour. Geography
Jour. Geology
Jour. prakt. Chemie
K. Akad. Wiss. Berlin
Kansas Univ. Geol. Survey
K.-k. geol. Reichsanstalt
K. preuss. geol. Landesanstalt
Lake Superior Min. Inst.
Liebig's Annalen
Louisiana Exper. Sta.
Maryland Geol. Survey
Min. and Sci. Press
Mineralog. Mag.
Mines and Minerals
Min. Mag.
Min. pet. Mitt.
Min. Sci.
Mississippi Agr. and Mech. Coll.
Nat. Geog. Mag.
Neues Jahrb.
New York Acad. Sci.
Oesterr. Zeitschr. Berg. u. Huttenwesen
Ontario Bur. Mines
Pennsylvania Top. and Geol. Survey Comm.
Petermanns Mitt.
Philos. Soc. Washington
Polytech. Gesell. Berlin
Pop. Sci. Monthly
R. accad. Lincei
R. comitato geol.
Roy. Soc. Canada
Sec. fomento, Mexico
Sci. Am.; Sci. Am. Suppl.
Seismol. Soc. America
Smithsonian Inst.
Smithsonian Misc. Coll.
Soc. cient. Ant. Alzate
Soc. géol. Belgique
Soc. geol. mexicana
Soc. toscana sci. nat.
Tech. Quart.
Texas Univ. Min. Survey
U. S. Dept. Agr.
U. S. Geog. and Geol. Survey Rocky Mtn. Region
U. S. Geog. Surveys W. 100th Mer.
U. S. Geol. and Geog. Survey Terr.
U. S. Geol. Expl. 40th Par.
U. S. Geol. Survey
U. S. Nat. Mus.
Victoria Inst.
Wagner Free Inst. Sci.
Washington Acad. Sci.
Zeitschr. anal. Chemie
Zeitschr. Kryst. Min.
Zeitschr. physikal. Chemie
Zeitschr. prakt. Geologie

"Op. cit." or "loc. cit." may be used if the footnote giving the previous reference is not far away, provided there can be no doubt as to what work is cited. If two works by the same author have been cited previously, it is necessary to repeat the reference. "Loc. cit." should be used only where the page cited is the same as in the previous reference. "Idem" (not id., ibid., nor ibidem) may be used only for a second citation of the same work immediately following the first.

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TYPOGRAPHIC STYLE.

The Survey publications conform, in general, to the Government Printing Office Style Book. A few of the more important rules are given below.

Capitalize the following terms, singular form, when used either before or after the name; also plural form when before the name:

Archipelago	Draw (streamway)	Isle	Point
Bay	Falls	Lake	Pond
Bayou	Forest	Mesa	Port
Borough	Fork	Mount	Range
Branch (stream)	Fort	Mountain	Reservation
Butte	Gap	Narrows	Ridge
Canyon	Glacier	Oasis	River
Cape	Gulch	Ocean	Run
Channel	Harbor	Parish (La.)	Sea
County	Head	Park	Sound
Crater	Hill	Pass	Spring
Creek	Hollow	Peak	Strait
Delta	Inlet	Peninsula	Valley
Desert	Island	Plateau	Volcano

Capitalize also the words "hills," "islands," "mountains," or "springs" where they immediately follow names denoting groups of natural features, as Black Hills, Aleutian Islands, Rocky Mountains, Hot Sulphur Springs.

Capitalize State (noun or adjective), singular or plural, and terms applied to groups of States, as North Atlantic, South Atlantic, Middle Atlantic, Gulf, Middle, Western; also terms denoting sections of the United States, as the West, the South, but write eastern Gulf States, western Central States.

Capitalize government in phrases like Government control, and capitalize national where it is followed by a word that is capitalized, as National Government.

Capitalize the names of genera, families, orders, etc., but lowercase the names of species, as *Ostrea bryani*, *Sequoia reichenbachi*.

Note the capitalization in the phrases below:

Allegheny Front
Appalachian Plateau
Appalachian province
Atlantic Coastal Plain
Badlands (South Dakota and Nebraska); but as a common noun, badlands
Coastal Plain region
Continental Divide
Cumberland Plateau
Driftless Area (upper Mississippi Valley)
Eastern Shore (Chesapeake Bay)
Falls (Niagara)
Gulf Coastal Plain
High Plains
Lower Peninsula and Upper Peninsula (Michigan)
Piedmont Plain (or Plateau)
Plateau province
Staked Plain
the Gulf (of Mexico)
the Isthmus (of Panama)
the Lakes (the Great Lakes)
the Plains (Great Plains)
the Sound (Long Island Sound)

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Capitalize titles of organized surveys (North Carolina Geological Survey, Maine State Survey Commission, etc.; the Survey), also such designations as Fortieth Parallel Survey, Hayden Survey.

Use the following contractions for names of States after names of cities, towns, counties, reservations, or national forests; also lakes, rivers, or other natural features:

Ala.	Ga.	Minn.	N. Y.	Tenn.
Ariz.	Ill.	Miss.	N. C.	Tex.
Ark.	Ind.	Mo.	N. Dak.	Vt.
Cal.	Kans.	Mont.	Okla.	Va.
Colo.	Ky.	Nebr.	Oreg.	Wash.
Conn.	La.	Nev.	Pa.	W. Va.
Del.	Md.	N. H.	R. I.	Wis.
D. C.	Mass.	N. J.	S. C.	Wyo.
Fla.	Mich.	N. Mex.	S. Dak.	

Idaho, Iowa, Maine, Ohio, and Utah should be written in full.

Use St. for Saint, but write Fort and Mount.

In references to public-land divisions use the following forms: In the NE. ¼ SW. ¼ sec. 25, T. 5 N., R. 14 E.; in the N. ½ sec. 25; in sec. 25; secs. 2 and 3; Tps. 4 and 5; Rs. 14 and 15. Note use of "the."

Names of railroads should not be abbreviated. Use the correct form—railroad or railway. If an old name must be used give the present name also. The railway guide will settle most doubtful points of this kind.

Decimals, degrees, dimensions, distances, enumerations, money, percentage, weights, and like matter should be expressed in figures (10°, 45 miles, 3 cubic feet, 24 pages, 100 bushels, 17 per cent, 41 pounds, $1,000). If the matter is not statistical spell out isolated numbers less than 10 (nine stamp mills; seven days; but "The cement was tested at 4, 28, and 160 days").

The degree mark should be used with figures in statements of dips and strikes: A dip of 10° SE., or 10° S. 35° E.; the strike is N. 45° E.; but the dip is southeast—that is, terms of direction should be spelled out unless figures are given.

Use "per cent" only with figures (a small percentage or proportion; 20 per cent). Do not use %.

Use "No.," not #, for "number."

Avoid a mixture of common and decimal fractions.

As numbers are not printed in figures at the beginning of a sentence it may be desirable to avoid placing them first. In the sentence "Four thousand eight hundred and fifty tons was produced in 1906 and 5,180 in 1907," convenience of comparison, if no other consideration, would require that both quantities be expressed by figures. The sentence may be rewritten: "The production was 4,850 tons in 1906 and 5,180 tons in 1907." Arrangements of figures or numbers

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shown in the following examples should also be avoided if possible: "This makes the total mileage of levels run in 1906, 38,307 miles;" "In 1906, 464 tons was produced."

Use "short and" (&) only in firm or corporate names, as Allyn & Bacon, John Wiley & Sons, Chesapeake & Ohio Railway, American Security & Trust Co. Names of persons who are associated in literary or similar companionships should be connected by "and," as Gilbert and Brigham, Meek and Hayden, *Mactra formosa* M. and H.

Nouns (including proper names) ending in s in the singular take the apostrophe and s in the possessive case, as Jones's, Stokes's.

In text use "feet" and "inches" not ′ and ″. Over a figure column use "Feet" or "Ft. in."

Write "above sea level," not "above tide" nor "A. T."

Foreign words are printed in roman, not italic.

In lists the names of fossils are printed in roman; in the text the names of genera and species (if generic and specific names are given together) are printed in italic, as *Inoceramus fragilis*, *Ostrea congesta* Conrad, and names of genera standing alone or of families or higher orders are printed in roman, as Inoceramus, Ostrea, Brachiopoda, Mollusca.

In the text and in reading columns of tables all units of measurement should be printed in full.

"The" should be omitted before full names of rivers, creeks, runs, etc. (as Green River, Missouri River, Pohatcong Creek, Fourmile Run), but "the Mississippi," "the Potomac" are acceptable terms for designating rivers.

Webster's New International Dictionary is the authority adopted by the Government Printing Office for spelling and compounding and will be generally followed; but note the form of the words below:

acidic	canyon	gage
acre-foot	cerusite	gastropod
afterward	clue	groundmass
aluminum	downward	laccolith
arrastre	draft	perlite
asbestos	employee	pneumatolytic
backward	eolian	poikilitic
badlands	esker	reconnaissance
base-level	farther (distance)	second-foot
bowlder	further (not distance)	upward
briquet	fluorspar	volcanism
can not	forward	vug

Most compound adjectives that precede the nouns qualified take hyphens, as "first-class work," "enlarged-homestead act," "pig-iron manufacture," "40-horsepower engine," "3-inch pipe." Use a hyphen after "well" and "ill" in phrases like "a well-established industry," "ill-advised action"; but write "the industry is well established."

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Omit hyphens if the first word of the compound adjective is qualified by another term, as "a fairly well defined rating curve;" also if one or more of the words are capitalized, as "Portland cement industry," "Geological Survey work." The prefix "non" is usually joined to the word it qualifies, but write "non coal-bearing rocks." Adverbs ending in "ly" are not compounded, as "hastily written matter," "carefully prepared report."

The ordinary rule for compound adjectives applies to color terms: Bluish-gray shale, light-green clay, light greenish-gray marble, slightly purplish gray marble, milk-white quartz, blue-green tourmaline, deep-reddish dolomite, gray-greenish beds, pale cream color. Hyphenate also, in any position, (*a*) a color term made up of two color names: The tourmaline is blue-green in color, this marble is pink-white; (*b*) a color term made up of a color name preceded by a noun that indicates the shade: Brick-red, olive-green, jet-black, sky-blue, milk-white, verdigris-green, flint-gray; (*c*) a color term made up of a noun that indicates the color followed by "colored," "tinted," or some similar word: Cream-colored, salmon-colored, tan-colored, ivory-tinted. "Colored" should always be used with a term that in its primary meaning does not express color, as chocolate-colored clays, not chocolate clays.

Adjectives formed by suffixing "like" to a noun should be written as one word if the noun has only one syllable (unless it ends in f or l); if it has more than one syllable the hyphen should be used.

business-like	eel-like	leaf-like
childlike	homelike	warlike

CORRECTION OF PROOF SHEETS.

Galley proof will ordinarily be sent to the author; also page proof if desirable and practicable. The proofs will bear marks made by proof readers and editors—corrections, suggestions, and queries. These marks should be carefully noted, and special attention should be given to queries—question marks on the margins of proof sheets opposite points at which doubt is indicated, inconsistencies are noted, information is wanted, or blanks are to be filled. Failure to note and answer such queries may necessitate the return of the proofs to the author.

Only reasonable corrections can be made in the galley proof, not radical alterations; and only slight, inexpensive changes will be permitted in the pages. As a rule additions can be made only to the galleys. If a considerable amount of matter is to be added it should be written on a sheet or slip, which should be pinned (not pasted) to the galley proof, the place at which the added matter is to be inserted being clearly indicated. Proof should be corrected and re-

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turned promptly to the editor of the Survey, who has been instructed to conform strictly to the requirements stated in this paragraph and must ignore all corrections made in violation of them.

Although it is not to be expected that an author will be familiar with the technicalities of proof reading, he should know the use and significance of the principal marks employed in correcting proof, in order that he may understand the meaning of the signs made on his proofs and that he may make his own corrections properly. A list of proof reader's marks and a sample of proof marked for correction are given on pages 24–25.

Every change or correction desired should be indicated by marks on the margin of the proof, not in the body of the printed matter, except as here noted. To indicate that something should be taken out, a line is drawn through it and the "dele mark" (ꝺ) placed in the margin of the proof. The dele mark should not be employed when something else is to be substituted for the matter expunged; in this case only the substituted matter should appear in the margin. To indicate that something should be inserted a caret (∧) is placed at the point in the text where the insertion should be made and the matter to be inserted is written in the margin. It is not necessary or proper to put a caret in the margin also. Punctuation and other marks which might be obscure if written alone are placed to the left of the "stop mark," thus: ,/ ;/ -/ (comma, semicolon, hyphen). The stop mark is used also to separate one correction from the next where they are crowded in the margin. A period to be inserted should be placed in a circle ⊙. The space mark (#) indicates that a space, such as is used between two words, should be inserted at the place noted by a caret in the body of the proof.

It is important that all marks of correction be made conspicuously and legibly, without possible ambiguity. As the editorial corrections are made with black pencil the author should use colored pencil or ink, in order that his marks may be readily identified.

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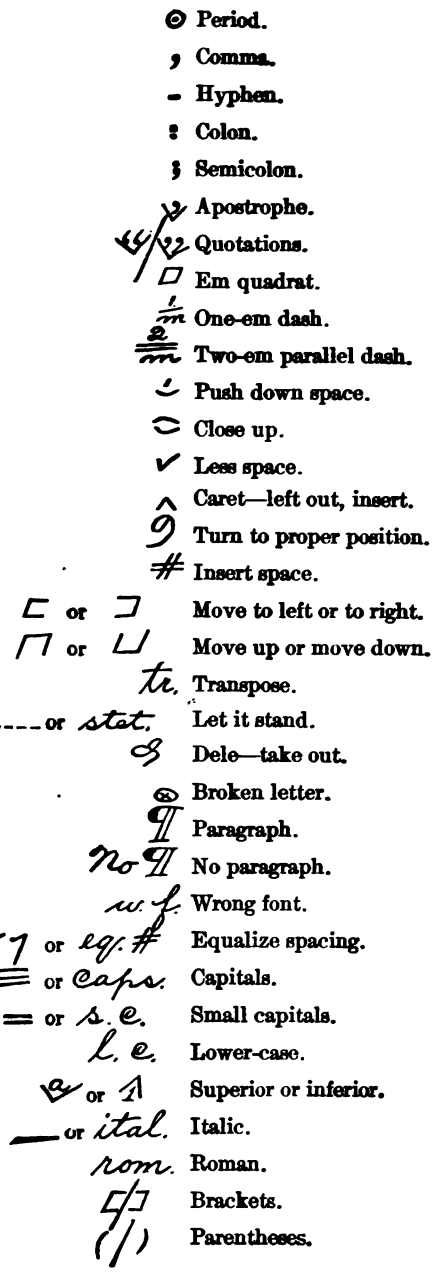
The following are the marks commonly used by proof readers to indicate corrections:



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TYPOGRAPHICAL ERRORS.

It does not appear that the earliest printers had any method of correcting errors before the form was on the press. The learned ~~The learned~~ correctors of the first two centuries of printing were not proof-readers in our sense, they were rather what we should term office editors. Their labors were chiefly to see that the proof corresponded to the copy, but that the printed page was correct in its latinity, ~~that the words were there,~~ and that the sense was right. They cared ~~but~~ little about orthography, bad letters or purely printers' errors, and when the text seemed to them wrong they consulted fresh authorities or altered it on their own responsibility. Good proofs in the modern sense, were impossible until professional readers were employed, men who had first a printer's education, and then spent many years in the correction of proof. The orthography of English, which for the past century has undergone little change, was very fluctuating until after the publication of Johnson's Dictionary, and capitals, which have been used with considerable regularity for the past 80 years, were previously used on the miss or hit plan. The approach to regularity, so far as we have, may be attributed to the growth of a class of professional proof readers, and it is to them that we owe the correctness of modern printing. More errors have been found in the Bible than in any other one work. For many generations it was frequently the case that Bibles were brought out stealthily, from fear of governmental interference. They were frequently printed from imperfect texts, and were often modified to meet the views of those who published them. The story is related that a certain woman in Germany, ~~who was~~ the wife of a printer, ~~and~~ had become disgusted with the continual assertions of the superiority of man over woman which she had heard, hurried into the composing room while her husband was at supper and altered a sentence in the Bible, which he was printing, so that it read Narr instead of Herr, thus making the verse read "And he shall be thy fool" instead of "and he shall be thy lord." The word not was omitted by Barker, the king's printer in England in 1632, in printing the seventh commandment. He was fined £3,000 on this account.

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ILLUSTRATIONS.

Publications of any class may be illustrated, but illustrations can not be used for mere embellishment; every one must serve a definite scientific or practical purpose and must be distinctly described or mentioned by number at the proper place in the text. The numbers should be assigned in the order in which such references appear. It should be noted, however, that an incidental mention of an illustration need not determine its position, which should be near the place where it is principally mentioned or discussed.

Drawings and photographs intended for use as illustrations should not be inserted in the manuscript but should be kept distinct from it, in a separate envelope or package, and the material for all the illustrations for a report should be submitted at one time.

Illustrations that bear geologic names should be submitted to the Survey's committee on geologic names with the manuscript.

Before any work is done on illustrations in the division of book publication they must be approved by the Survey's committee on illustrations, to which they will be submitted when received by the division. The author should carefully verify all references to illustrations after the numbers have been finally assigned, seeing that all references give the correct numbers and that no references to illustrations that have been cut out are left. The classification of the illustrations into plates and figures will be made in the division of book publication, and the author should, if possible, confer with the chief of the section of illustrations on this point before finally numbering his plates and figures. Most reproductions of photographs and landscapes and of drawings for colored maps will be plates, but diagrams, graphic sections, and most other line drawings will appear as figures. Figures are printed with the text; plates are, as a rule, printed separately from the text and are bound into the book at the proper places or put in a pocket at the end of the book.

The list of illustrations should consist of brief titles of the plates and text figures, grouped separately and arranged in order. The plate numbers should be in roman, as Plate IV; the figure numbers in arabic, as figure 4. Subdivisions of plates should be lettered with italic capitals, as Plate VI, *A;* subdivisions of figures with italic lower-case letters, as figure 1, *a*. The number of the manuscript page on which each plate or figure is described or principally mentioned should be written opposite its title in the manuscript list. Detailed explanations of parts or features of illustrations should not be given in the list but should be incorporated in the text or in the legends or titles. The legends of the text figures (but not those of the plates) should be written in the manuscript at the places where the figures are to appear. These legends should include not only the

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titles but all necessary details, such as explanations of symbols or letters that appear on the figure. Full descriptions of the plates, comprising the matter to be printed on or opposite them, should be furnished if the brief titles given in the list of illustrations are not sufficient.

Two identical copies of the list of illustrations should be made after the numbers have been finally assigned, and both should be transmitted with the manuscript.

The letter transmitting the manuscript of an illustrated report should mention the illustrations and give their aggregate number, by plates and figures.

The paper used by authors for their original drawings should be of good quality and of a tint that will afford a good photograph. Some of the drawings prepared by authors, if made with care, can be utilized, in whole or in part, for direct photographic reproduction by the lithographer or the engraver. Therefore brown or yellow paper should not be used; white paper or paper having a slight bluish tint is preferable.

Black, indelible ink of good quality should be used. All the lines of the drawing should be firm and distinct; all lettering should be plainly written in pencil, without effort at ornament.

The original drawing for a text figure should be larger than the figure as it will be printed in the report but should not be so large that the sheet on which it is drawn will be inconvenient to handle. Most figures can be advantageously drawn for a linear reduction to one-half or one-fourth—that is, the distance between any two points in a drawing should be twice to four times the distance between the corresponding points in the printed figure. The size of the printed page in bulletins and water-supply papers is 4⅜ by 7½ inches, in monographs and professional papers 6 by 9 inches. These dimensions include the space allowed for the page heading and the title of the figure. Plates may exceed these limits, but text figures should be no wider than the text page and at least half an inch shorter.

Each drawing and photograph should be marked to show the number and title it will have in the printed report for which it is prepared and should bear in addition, if necessary, a memorandum indicating the special feature or features it is used to illustrate. Each photograph should also be marked to show its source, as, for example, with the number of the negative in the Survey's collection or with the name and address of the photographer. Written permission must be obtained for the use of a copyrighted photograph, and credit to the owner of the copyright must be given on the printed reproduction.

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In grouping photographs by twos or fours for reproduction as a plate the author should consider the appearance of the group as a whole; for example, a larger or darker photograph should be placed below a smaller or lighter one. Each group of this kind should, as far as possible, be made up of illustrations that are mentioned or described at nearly the same place in the report, in conformity with the rule that illustrations should appear in the order in which they are described.

Every map, whether compiled from other maps or prepared by means of a special survey, should show the sources of all the data it embodies, including the names of the surveyors and the date of the survey. If it is prepared under a cooperative agreement it should bear the name of the cooperating organization.

Before an author transmits for publication the material for illustrations he should confer with the chief of the section of illustrations concerning details of the work, especially with respect to the base maps to be used. In addition to this consultation detailed written explanations of all illustrations are desirable. Probably 20 per cent of the time employed by draftsmen in making final drawings is consumed in interpreting the meaning of uncertain features shown in crude original drawings. Authors can prevent this loss of time by adding to the drawings full pencil memoranda or explanations of features that may be difficult or doubtful of interpretation. These memoranda will also be useful when the author can not conveniently be consulted and they may be the means of avoiding long delays incident to correspondence.

Certain material, such as illustrations of fossils, that may require expert or special preparation may be submitted to the section of illustrations before the manuscript is transmitted, but authority for the preparation of the drawings in advance of the presentation of the manuscript must be obtained from the Director. If a second installment of such material is sent, the letter transmitting it should refer to the material previously submitted and give the title or subject of the report to be illustrated.

The completed drawings for the illustrations of a report will be submitted for approval or correction to the author, who should indicate his approval by signature. If corrections are necessary he should indicate them clearly on the illustration or on a memorandum to be attached. After the author has thus approved or corrected the drawings no further alterations in them can be made except by authority of the Director.

Proofs of illustrations will be sent to authors when they can be reached without causing much delay in publication. Approval should be indicated by signature and the proofs should be returned immediately. Changes involving alterations from copy can not be

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made at this time unless they are of great importance or are necessary to correct conspicuous errors, and such changes can not be permitted without the consent of the Director. Even slight alterations at this stage may make reengraving necessary. Engraved cuts or plates can generally be altered only by cutting off lines or other features; no considerable additions can be made.

The original cuts of many illustrations used in Survey reports are preserved and can be reused. An author who may desire to reuse any illustration should give its number and the number of the report in which it appeared. If a cut is desired for use in an unofficial paper, an electrotype can be furnished at cost. Requests for electrotypes for unofficial use should be addressed to the Director.

GEOLOGIC FOLIOS.

Authors of geologic folios should note the following suggestions, which are condensed from a pamphlet issued by the Survey in 1904.

GENERAL SUGGESTIONS.

It is neither desirable nor possible to make all folio texts conform strictly to a single type, but the point of view, the scope, and the general arrangement should be fairly uniform.

Point of view.—The author should have constantly in mind the primary object of the folio, which is the presentation of a clear picture of the region described. He should therefore endeavor to put himself in the mental attitude of a person—preferably not a trained geologist—who has never seen the region and who must form his conceptions of it chiefly from the written report. Too much dependence should not be placed on the cartographic picture, for most laymen do not read maps with facility.

Scope.—Although the folios are intended for both laymen and geologists, the descriptive text should not trespass on the subject matter of a geologic textbook. The folio-cover text includes most of the definitions that are necessary. With reference to the needs of the layman, it will ordinarily be better to explain the technical ideas connected with the local descriptions than to define technical terms, but in some folios the need for repeated use of the idea will be best met by first defining and afterward using the corresponding technical term. It is manifestly impossible to make provision for any but the educated layman, and some material may be admitted which even he will not readily understand, provided the text as a whole is fairly intelligible to him. Those technicalities of the specialist which are not understood by the body of geologists or by specialists in other departments should generally be avoided. Important matters of particular interest to the specialist may be concisely stated without descriptive details.

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The text should be devoted mainly to the discussion of facts of permanent interest. For example, in the discussion of mineral resources, mode of occurrence should receive fuller treatment than amount of development. Also, more attention should be given to the accurate description of the phenomena of the area than to hypotheses of origin and history of development. Such hypotheses should be stated tersely and clearly and not in controversial or argumentative form. If the hypothesis is unverified or is supported mainly by phenomena outside of the area discussed, whatever doubt may exist as to its validity should be mentioned.

Arrangement.—The material should be arranged under a few main heads; five or six will generally suffice, though more may be used if exceptional importance of special features makes their coordinate treatment necessary.

INTRODUCTION.

The introduction should include a brief statement of the location of the quadrangle in respect to latitude and longitude and to State and county boundaries. The area should be stated exactly, to the nearest whole number of square miles, which can be ascertained by reference to "Geographic tables and formulas," published by the Survey as Bulletin 234 and as an unnumbered pamphlet.

If practicable, the folio should include a brief description of the main geographic and geologic features of the natural province of which the quadrangle forms a part. This may be repeated with little change for all the quadrangles in the province. As it is intended chiefly to supply the layman with the necessary background for the detailed discussion to follow, it should be written in language as free as possible from technical expressions. The exact relations of the quadrangle to the natural province should be clearly stated.

TOPOGRAPHY.

The description of the topography should be general in character, its principal purposes being (*a*) to furnish a local nomenclature to be used in the descriptive geology and (*b*) to direct attention to features represented on the topographic map which would be likely to escape the attention of the untrained map reader.

The origin of the topographic forms can be most advantageously treated after the stratigraphy and the structure have been described. Its discussion naturally forms a part of the geologic history. The fact that relief is discussed in this section and physiography in a later one need not prevent the treatment of physiographic expression as a part of the description of rock formations.

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DESCRIPTIVE GEOLOGY.

Stratigraphy.—The description of the sedimentary formations should generally be systematic, though it may vary in detail for different regions. If the formation units have been long established and are well known the description may be relatively brief. The definition should include (*a*) lithologic character; (*b*) physiographic expression, provided that is characteristic; (*c*) paleontologic character; (*d*) name and correlation; (*e*) thickness; (*f*) areal distribution; (*g*) relation to adjacent formations, especially character of upper and lower limits, whether by gradual passage or unconformity. These items need not be considered in the order given above; peculiar conditions may justify their discussion in a different order.

Under the heading "Paleontologic character" at least three conditions may require somewhat different treatment. (1) If the fauna or the flora is well known it will be sufficient to give, in a brief paragraph, a broad classification of the fossils, with mention of a few species that may be useful in identifying the formation. (2) If the fossils are of doubtful significance or if the life of the epoch is not well known a somewhat more explicit statement is desirable. (3) If the fauna or the flora is very scant or poorly known or if the investigation has added valuable new material a still more detailed reference to specific forms may be made, especially if the assigned age has been determined on this newly discovered evidence or if divisions are based on paleontologic difference. If the geologist is not also a paleontologist he should procure a concise statement from the paleontologist and quote it.

The description of the igneous rocks should be treated primarily as an explanation of the cartographic units adopted. A generalized pen picture of the rock, giving its obvious characters, should be followed by a more technical description showing which characters are general and due to the type of the magmas erupted and which represent local conditions of consolidation. A concise characterization for the petrographic specialist is desirable, but no extended description or discussion of details, such as would interest the specialist only, should be given. In general those features of the rock which have a bearing on and are essential to a discussion of the geology of the region should be described. Chemical analyses should be given, if available, with brief comment as to their significance, but with no detailed or technical discussion.

The method of treating metamorphic formations should depend on the relative prominence of their original and their acquired characteristics. If the original characteristics are the more important the treatment should be similar to that of sedimentary formations;

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if the acquired characteristics are the more pronounced the treatment should be the same as that of igneous rocks.

Glacial deposits may be considered historically in folios describing areas in which such deposits are the principal surface formations.

Structure.—The description of the geologic structure should be clear, concise, and as free as possible from technicalities and from theoretical discussion of the causes producing it. The importance of this subject differs greatly in different regions, and its treatment should be determined by its importance. In some regions the structural features, though inconspicuous, are highly important by reason of their influence on the accumulation or exploitation of mineral deposits, such as oil, gas, and coal. The discussion of such features should be sufficiently full and explicit to form a groundwork for the subsequent discussion of the mineral resources. The relation between structure and mineral deposits should be pointed out in connection with descriptions of those deposits.

GEOLOGIC HISTORY.

The discussion of the geologic history should present a connected account of the area by the recognized geologic periods. The subdivision into "Sedimentary record," "Igneous record," and "Physiographic record" is suggested as being generally applicable, but in many folios the sedimentary and igneous history will necessarily be combined in a chronologic account of events. The "Physiographic record" should include a discussion of the origin of the present topographic forms.

MINERAL RESOURCES.

In general the detail devoted to economic geology should be roughly proportional to the value or quantity of the resources and the need of information. Particular care should be taken to record such general facts in regard to the mineral resources as will enable the reader to make an intelligent estimate of the value of both the developed and the undeveloped deposits. If the mineral resources are extensive and if a large amount of detailed information that is of economic value has been collected, the material should be prepared for publication as a bulletin and the discussion of the economic geology in the folio text should be confined largely to a statement of the purely geologic relations of the mineral deposits.

More attention should be devoted to water resources in a folio that relates to an agricultural or ranching country than in one that describes an area where mining is the dominant industry, and, similarly, in a folio that treats of an arid or semiarid region than in one that treats of a region which is well watered and in which the problems of water supply are well understood. The discussion of the underground

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water supply should include (*a*) an enumeration of the water-bearing formations or beds and descriptions of their character supplementary to those given under "Descriptive geology"; (*b*) a description of the geologic structure of the water-bearing beds, with statements of depth and of elevation of outcrop; (*c*) a statement as to the quantity and character of water.

REPORTS ON MINING DISTRICTS.[1]

The following suggestions and definitions, condensed and revised from a pamphlet issued in 1906, are offered to Survey writers on the economic geology of mining districts as representing the practice to which they should endeavor to conform.

GENERAL SUGGESTIONS.

Point of view.—The remarks on the point of view given in the suggestions to authors of geologic folios (p. 29) are equally applicable here and need not be repeated.

Geology in its economic bearing.—The writer should bear in mind that an economic report may be used by readers who are not geologists, and he should therefore avoid as far as possible technical words with which they are not likely to be familiar. If the use of such words is unavoidable it may be desirable to explain briefly their meaning.

Stress should be laid on those geologic facts that have direct economic interest. Purely theoretic or scientific material, such as petrologic discussions, may often best be reserved for separate publications. If it seems desirable to include such material in an economic report, it may, by paragraphing in smaller type, be kept distinct from the main body of the report.

Order of treatment.—The order of treatment should follow the principle of first giving the reader a general idea of the subject under consideration before proceeding to detailed description—the reverse of the process by which the author usually arrives at his results. This suggestion applies not only to the whole report but also to the treatment of individual topics. Thus, before describing the geology of the ore deposits of a district, he might give a brief characterization like this: "It is an area of granite intruded by andesite, which is in turn cut by phonolite dikes," or "The deposits are narrow, vertical veins cutting granite, andesite, and phonolite and conforming in general direction with the phonolite dikes." In this way the reader starts with a general idea of the subject and is able to see the bearing of the facts observed and presented by the author.

[1] Prepared originally in 1906 by S. F. Emmons; revised in June, 1913, by F. L. Ransome.

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SUBJECT ORDER.

The general order of treatment here recommended is applicable to a complete report on a mining district, and a paper of different scope may well follow a similar general order so far as it can be applied to the facts presented. The titles of the headings may be modified according to the varying conditions in different regions and the taste of the author, the main point being that he should have some definite plan in mind before he begins to write. The general heads may comprise the following:

1. Preface.
2. Outline of the report.
3. Introduction, or prefatory matter.
4. Geography and history.
5. Geology.
6. Ore deposits.

Preface.—The preface should be written and signed by the geologist in charge of the administrative unit to which the author belongs. It should indicate the character and purpose of the investigation and call attention to important features or results set forth in the report and to their bearing on regional or other broad problems.

Outline of the report.—The author should write a brief but carefully prepared abstract of the report, with a view not only of giving the reader a preliminary survey of the work but of affording an authoritative outline for the press.

Introduction.—The introduction may comprise a statement of the conditions under which the work was done, acknowledgment of favors, and mention of previous work in the same field, the matter under this heading ending with a bibliography, if the literature on the district discussed is sufficient to warrant it. Bibliographies are more useful if the title of each paper is followed by a brief abstract of its contents.

Geography.—The section on geography should describe location, routes of approach, topography, climate, vegetation, and other geographic features. Relief and drainage should be described as present features of the landscape, but their genesis and evolution should be discussed under "Geology."

Geology.—The discussion of the geology should present general geologic information with regard to the region, in the following order: (*a*) The character and composition of different rock formations in order of age, commencing with the oldest and distinguishing sedimentary from igneous; (*b*) the distribution and structural relations of the formations; (*c*) metamorphism; (*d*) the development of topographic features with special reference to lithology and geologic structure.

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Ore deposits.—The description of the ore deposits as a whole and the discussion of their genesis should form the principal part of the report. In this section the subdivisions suggested below may be enlarged or condensed according to the nature of the deposits, but the general order of subjects should be preserved.

(*a*) History of mining development. In this section the author may relate the successive steps in the local progress of the mining art and state the present conditions. In some reports that are essentially economic this history may follow the "Introduction."

(*b*) Production, including annual and total output of mineral products, with sources of information.

(*c*) General character of deposits, such as fissure veins, replacement deposits, contact deposits.

(*d*) Mineralogy—enumeration and brief description of gangue minerals, of original metallic minerals, in order of value of metal or other distinctive feature, and of secondary minerals or products of alteration, in the same order; also paragenesis or succession of minerals, and its bearing on genesis.

(*e*) Description of the deposits—distribution and geologic features, structural relations, primary deposition, underground water, secondary deposition and alteration of ore and country rock, distribution of ore in the deposits, age of original and secondary deposits, value of ores and its dependence on geologic conditions.

(*f*) Genesis of the deposits. In the section on genesis the author should recapitulate the essential facts brought out in his descriptions, show their bearing on the problem of origin, and deduce such theoretical conclusions as they may warrant.

(*g*) Practical applications. Under this head the geologist may point out how his work may aid the miners in developing their ore bodies or in finding new ones and may forecast, if possible, the economic future of the district.

(*h*) Detailed descriptions of mines. In the detailed descriptions of the individual mines or groups of mines the general order of treatment indicated above should be followed. It is well to select one or more of the principal or characteristic mines as types to be described in considerable detail. The amount of detail for the others should depend somewhat on the importance of the mines and the degree in which their deposits vary from the type.

DEFINITIONS.

The following definitions of certain terms in common use are sanctioned by the practice of the Survey, and it is desirable to adhere to them in Survey reports, as a lack of uniformity in the use of such terms is likely to cause misunderstanding.

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MATERIALS.

Ore.—Ore may be defined as a mineral or natural association of minerals from which one or more of the useful metals may be profitably extracted. Material that can not be profitably worked to-day may become of economic value a year or so hence without any change in character. Consequently, in using the term "ore" it is necessary to take into account the effect of changing economic conditions and of probable improvements in metallurgical processes.

Gangue.—The term "gangue" is properly applied only to the earthy or nonmetallic minerals that are of common occurrence in ore deposits, such as quartz, barite, chlorite, fluorite, calcite, and dolomite. The practice of describing as gangue any metallic minerals that may happen to be of no economic value is not desirable, even if they are called metallic gangue, for it permits no uniform distinction between ore and gangue.

In describing the minerals occurring in an ore deposit it is well to distinguish the gangue minerals that are exogenous—those that have been brought in from some outside source—from those that are the product of alteration of the wall rock or country rock.

Vein material.—As a collective term to describe the aggregate of materials which make up the ore body the phrase "vein material" or "vein stuff" may be used. "Vein stone" is less desirable, for the reason that "stone" is used by some mining men as a technical term for ore, and others make "vein stone" synonymous with "gangue."

Gouge.—Gouge is a soft, clayey material occurring in some places as a selvage between a vein and the country rock and usually formed by the trituration of the country rock by motion subsequent to the formation of the vein. The term should not be loosely used for any soft, crushed material.

Country or country rock.—"Country" is the miner's term for the rock which incloses an ore deposit. The term "country rock" has been criticized as tautologic; nevertheless, it is sanctioned by very wide usage, and its use is considered advisable where the single word "country" might lead to confusion in the mind of the nontechnical reader.

FORMS.

Vein, lode, vein system.—The material filling a fissure, when not injected as molten matter to form a dike, is termed a vein. Most veins are of nearly tabular form. An ore-bearing vein is a single body of metalliferous minerals occupying or following a fissure, both walls of which generally, but not invariably, are well defined. Where several veins are so closely spaced that the ground between them becomes in places ore bearing and in its whole width constitutes an

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ore body, the assemblage is called a lode, although in legal phraseology lode or lead is synonymous with vein in a broad sense. The term "vein system" may be used for a larger group of veins and may include several lodes. The fractures of the earth's crust that admit of ore deposition are so multiform that it is not possible to give stricter definitions. Usage may differ somewhat in different districts, but the general order from simpler to more complicated deposits will be vein, lode, vein system. The more subordinate deposits, such as little veins that cross the material included between vein walls, may be called veinlets or stringers.

Shear zone.—The term "shear zone" belongs more properly to general geology, being used to define the zone along which the rocks have been sheeted or laminated by a shearing stress with some lateral movement but which is by no means necessarily or even commonly mineralized. It denotes a structural feature along which ore may be deposited but which is not itself a form of deposit.

Sheeting.—The term "sheeting" or "sheeted zone" may be used where the movement has resulted in approximately parallel fissures that have thin sheets of country rock between them.

Bedded deposit, bed deposit.—In contrast with veins, which cut across the bedding of the inclosing rocks, some deposits conform with the stratification. Such deposits are frequently called bedded deposits, but this name suggests that they were laid down as members of the stratigraphic series in which they occur—that is, that they are syngenetic deposits. The term "bed deposit" is of broader application; it will cover such deposits as may have been subsequently introduced between the beds—that is, epigenetic deposits. Among miners the term "blanket vein" is usually applied to any nearly flat deposit.

Gash vein.—The term "gash vein" has been employed to describe a vein that fills joints or fissures in limestone in the lead deposits of the Mississippi Valley region. A gash vein does not extend beyond a single bed or similar rock mass.

True fissure vein.—Whitney ("Metallic wealth of the United States") used the term "true fissure vein" to describe a true vein as distinguished from a gash vein, the latter being limited in extent, whereas the former, according to him, "may be presumed to extend for an indefinite distance downward." From this statement apparently has sprung the idea common among miners that a "true fissure vein" is the most desirable form of mineral deposit, because of its indefinite extension. This is a popular delusion that it is not desirable to perpetuate; hence the use of the term should be avoided. "True vein" was the term in use before Whitney's publication, and among the earlier writers on ore deposition it signified an ore body filling a fissure; hence the term "fissure vein" is in a strict sense pleonastic and should not be used in classification.

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Structure of vein material.—The following forms of structure may be recognized in the material filling a fissure:

1. Banded structure, where the vein shows in cross section a banding approximately parallel to the wall. This may be subdivided, according to origin, into—

(*a*) Banded structure by filling, in which the filling is evidently a series of layers of vein material deposited successively on the walls of an open space. If the layers are symmetrically arranged on either side of a central band containing druses with crystals pointing inward, a variety called comb structure is produced.

(*b*) Banded structure by subsequent movement, which is produced by a simple sheeting of the vein material after original deposition and is called ribbon structure. Such movement may result in a reopening along the new plane of movement and the deposition of new material in the opening.

(*c*) Banded structure by replacement, formed where the original fissure consisted of a number of parallel openings separated by thin bands of country rock and where, during or subsequent to the filling of these openings, the intervening bands of country rock have been more or less completely replaced by vein material.

2. Breccia structure, formed where the friction breccia or dragged-in fragments of country rock constitute a considerable portion of the vein filling and the ore has been deposited in the spaces between the fragments, perhaps in more or less concentric shells or layers around them. Breccia structure may occur in any vein; hence it is not desirable to use "brecciated vein" as a term of classification.

Linked veins.—Deposits filling approximately parallel and overlapping fissures, arranged in steplike form and connected or linked by small, irregular cross stringers, are called linked veins. As the deposit pinches out on one fissure it is taken up on one of the overlapping fissures.

Stringer lode.—A stringer lode is made up of irregularly branching and anastomosing stringers or veinlets. In most lodes the rock between the veinlets is so much metallized or is so inseparable from the stringers that the whole is worked as a single ore body.

Chimney, stock.—The term "chimney" is applied to ore bodies which have not the tabular form of a vein but are rudely circular or elliptical in outline horizontally and have a very considerable vertical extent. A similar body of still greater irregularity of outline is called a stock.

Stockwork.—A stockwork is an ore body that is of stocklike form but that is made up of innumerable branching and anastomosing stringers, as in a stringer lode.

Ore shoot, pay shoot.—An ore shoot or pay shoot is that part of a metalliferous deposit which is rich enough to exploit. Its outlines are not generally well defined. The ore shoot may be considered as

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having three axes, at right angles to one another. The inclination of the longest axis to a horizontal plane is called the plunge and is measured in a vertical plane erected along the axis. The angle made by this axis with a horizontal line, measured in the plane of the vein, is called the pitch. In an ore shoot that is part of a vein the dip of the vein and the plunge of the ore shoot coincide when the pitch is 90°. (See *Dip, pitch*, p. 41.)

The true dimensions of an ore shoot would be shown by giving the length of its longest axis and the area of one or more cross sections normal to that axis. Inasmuch, however, as its true form can rarely be determined until all the ore has been mined, it is common practice to speak of its length and width or thickness as those of a horizontal section of the body on a given level of the mine. These are evidently not true dimensions unless the longest axis of the body is vertical. It is advisable to follow the usage adopted by Lindgren and Ransome in their Cripple Creek report and call the longest axis "pitch length" and the horizontal dimension along the level "stope length." (See fig. 1.)

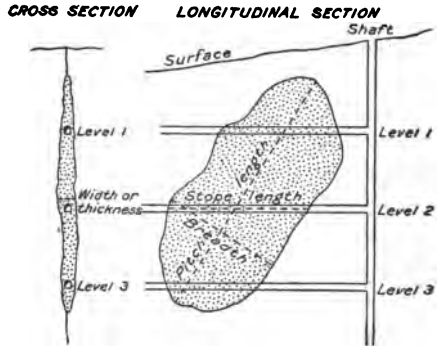

FIGURE 1.—Diagram illustrating application of terms used in describing ore bodies.

Contact deposits.—The term "contact deposits" should be restricted to deposits which have been formed by igneous metamorphism and which carry the minerals characteristic of such action. This use eliminates from this category many forms of deposit that have been so termed simply because they happen to occur between two different kinds of rock. Contact deposits, as thus restricted, occur mostly in limestone at or near its contact with an intrusive igneous rock. They are very irregular in form. Mineralogically they differ from other deposits by the contemporaneous formation of oxides and sulphides, principally of iron, and by the association of the metallic minerals with lime-silicate minerals.

Segregated vein.—The term "segregated vein," which has been used to define materials that have been concentrated in a sedimentary bed, would be more appropriately used for the material gathered together from a molten magma. In either sense it is not sufficiently distinctive to be used to characterize any single type of deposits.

Impregnation.—As a general rule care should be taken to avoid using the name of a process as the definition of a type of deposit. The term "impregnation," for instance, has been used by different

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writers in many and conflicting senses. It properly signifies the introduction of mineral substances in a finely disseminated condition into rocks, either as a filling of open spaces or as a replacement of certain minerals. To describe ore occurring in small, irregular, disconnected particles throughout the mass of a rock, "disseminated deposits" is a preferable term, for it has no genetic signification.

PROCESSES.

Metasomatism.—Metasomatism may be defined as the process by which, through chemical interchange, a mineral or an aggregate of minerals undergoes partial or complete change in chemical constitution. The term "metasomatism" is of wider application than "pseudomorphism," for the process it designates does not necessarily involve the preservation of the crystalline form of the original mineral. It may or may not be accompanied by a change in volume.

Replacement.—As a general term synonymous with "metasomatism," "replacement" is preferable to "substitution," which is a chemical term strictly defined as "the replacing of one or more elements or radicals in a compound by other elements or compounds," a restricted usage to which "replacement" is not confined. Replacement may be either partial or complete, according as only a part or the whole of one rock or mineral has been replaced by another.

Alteration.—The term "alteration" applies to the partial change of substance in a rock or mineral which does not necessarily involve its replacement by another. The process is purely chemical.

Decomposition.—The term "decomposition" signifies the decay of a rock or mineral into secondary products, usually accompanied by disintegration, so that it involves a physical as well as a chemical change and is most commonly effected by weathering.

Weathering.—The term "weathering" should be confined to changes in cohesion and composition of rocks near the surface by the decomposing and oxidizing action of surface waters, by variations in temperature, and by other atmospheric and surface agencies. The tendency of such changes is to destroy the rock as a geologic unit.

Enrichment.—In many sulphide deposits the valuable metals have been concentrated by solutions that have descended from the zone of oxidation. As commonly used, the expression "secondary enrichment" is tautologic and should be avoided.

MINING TERMS.

In describing a mine it is well to state concisely the extent and character of the mine openings, for which the terms in general use, given in the following paragraphs, should be employed. If a local term, not in general use, is employed its meaning should be stated.

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Shaft, incline, slope, winze, raise, chute, stope.—The term "shaft," when not qualified, means a vertical opening starting at the surface. A shaft that follows the inclination of a vein or bed that is not vertical is called an inclined shaft, or simply an incline. In coal mines such an incline is commonly termed a slope. Passages within a mine driven upward from a horizontal gallery are called raises or upraises; those driven downward are called winzes. Inclined raises or winzes are often termed inclines. When used for sending ore down from a higher to a lower part of the mine such passages are termed chutes, ore chutes, or mill holes. A stope is an opening made in extracting ore.

Tunnel, adit, drift, crosscut, level.—Properly defined, a tunnel is an underground gallery open to the air at both ends, an adit is open at only one end, and drifts and crosscuts are horizontal galleries that do not reach the surface. In the United States, however, the term "tunnel" has come into use among miners in a sense more or less synonymous with "adit" and in this sense it is recognized by the mining law; hence it can not be confined to its original meaning.

The following distinctions are made by miners and may well be observed in writing: A drift follows the general strike of an ore body, vein, or rock structure. A crosscut, as its name implies, crosses the trend of the ore or rock structure. Stations are roomlike enlargements of drifts or crosscuts where they connect with a shaft. All the drifts and crosscuts that connect on approximately the same horizontal plane with a station or with an adit constitute a level. If the level opens to the surface through an adit it is termed an adit level.

Dip, pitch.—Dip is the angular divergence of a bed or of a tabular deposit, such as a vein, from a horizontal plane. The term "pitch," originally used to signify the inclination of the axis of a fold from a horizontal line, has come into use among miners to express the inclination of the longest axis of an ore body or pay shoot within the plane of the vein. It should not be confounded with dip. (See *Ore shoot*, p. 38.)

Mine, prospect.—It may be difficult to decide whether a certain property shall be called a mine or a prospect, and no hard and fast rule can be laid down for universal application. In general, shafts that are less than 100 feet in depth, with less than 100 feet of drifting, and that have not produced ore in commercial quantity should be termed prospects. The essential feature of a mine is the production of ore in marketable quantity, but an unproductive property may be so extensively developed and equipped that it may be called a mine rather than a prospect.

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SUGGESTIONS AS TO EXPRESSION.

GENERAL OBSERVATIONS.

No general rule as to the intellectual plane or the literary style or quality of the Survey's reports can be given. In determining these features the subject discussed, the nature of the report, and the kind of readers it will probably find should be considered. A report that is likely to be of popular interest may differ in style from a technical discussion, yet both may be written correctly and clearly, with all necessary spontaneity and naturalness. In writing a report that may be of general interest or that may find readers who are unfamiliar with scientific or technical terms, an author may profitably bear in mind the saying that "the ideal of style is the speech of the people in the mouth of the scholar."

A careful writer will not only consider fully the general order of the matter of his report and its arrangement under appropriate headings but will divide it properly into paragraphs and will choose deliberately the subject and the subject nominative of each clause, preferring concrete terms in discussions of concrete things and beginning and ending each sentence in such a manner as to give important words and phrases the place of emphasis. He will not write very long or extremely involved sentences, nor, on the other hand, will he allow his style to be made "choppy" by a succession of sentences that are too short. He will choose words of certain, definite meaning, preferably familiar words, will arrange them in proper order, and will try to write in such a way that the reader's attention will be held by the matter of his story and not distracted by the manner in which it is told. In short, recognizing the fact that writing is an art, he will try to cultivate it, observing not only its larger demands but even its smaller proprieties, assured that the reader will reap the reward of his care and patience.

Correctness, clearness, and conciseness are ideal qualities of good scientific writing. Clearness alone is not sufficient, for a statement that is entirely clear may contain serious grammatical errors or may be expressed in terms that are not well adapted to a scientific report; and conciseness may be gained at the expense of both clearness and correctness. The attempt, however, to conform strictly in all respects to the recognized standard of correctness—present good usage—may involve tedious and inconclusive research as to points in question. Current dictionaries and grammars afford the readiest means of determining most doubtful questions, but in addition to these the Survey has provided a shelf of manuals of instruction or criticism which are at the service of its writers.

It has often been contended that much scientific writing is not only slovenly in style but obscure or unintelligible in meaning, and a

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critical examination of many scientific papers will sustain this contention and will show that their bad form and obscurity arise from utter neglect of details of expression. In any paper every word or phrase of doubtful meaning, every word or phrase misused or misplaced is a fault—it may be a serious fault—and such faults abound in many scientific papers. It is not unreasonable to maintain that the literature of science should display both clearness and accuracy of statement; that its terms should be unmistakable and its phrases both precise and concise; and that it should exhibit throughout that reasonably good form which will commend it to the favorable judgment of an intelligent critic of expression. A constructive dissertation on the principles of literary style would be out of place here—the subject is too broad and too complex for brief treatment—but under the following headings some of the commoner faults appearing in the manuscripts of Survey reports are noted, with the hope that they may be avoided.

COMMON VERBAL FAULTS.

WORDS MISUSED OR OVERUSED.

The word "occur," meaning to appear or to be present, is very much employed in geologic literature, in many relations with doubtful propriety, where better words may be substituted. "Occur" is a useful word, but when Survey authors write "Trees occur on these slopes," and "The mines occur in Pope and Hardin counties," a critic may properly wish that other words had been used in these sentences.

"Data" (in many papers wrongly qualified by "this" or "much" or other term of singular number) is also greatly overused by some writers, appearing in places where synonyms can easily be found.

The verb "secure" is by many used in the sense of assure, insure, procure, obtain, or get, as well as in its other senses, with a range of meaning far too wide for scientific exactness.

"Inaugurate" or "initiate" is used for "establish" or "begin," as, "Work was inaugurated in June," "The investigation was initiated in 1908;" and "inauguration" is used for "beginning," as in the phrase "previous to the inauguration [before the beginning] of Cretaceous sedimentation."

"Limited" and "restricted" are improperly used in the sense of "slight," scant," or "small."

"Quite" is by some writers used for "very," "somewhat," or "rather," or is used superfluously. Phrases like "quite large," "quite a distance," "quite a few" should be avoided. It is suggested that "quite" be used (if used at all) in its primary sense, to mean "entirely" or "completely," as in the phrases "quite conclusive," "not quite finished." If used generally in this sense its sig-

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nificance in a phrase like "white, plastic clay quite free from sand" would be unmistakable, whereas, owing to the uncertain value of the word as employed by many writers, the exact meaning of the phrase quoted is doubtful.

"Important" is by some writers greatly overused. As a rule it is not the most appropriate word unless it is accompanied by some term denoting why or how the thing described is important, as "commercially important." It should not be used for abundant, conspicuous, valuable, or any other word of clearly defined meaning. Note: "The *most important* [best] route across the region." "The most *important* [abundant] igneous rock in this area."

"Horizon" is used for "bed" or "stratum," as in the sentence "This horizon is 4 feet thick. The term "horizon" when properly used expresses only position. Instead of "This horizon is oil bearing in all parts of the field" a writer may better say, "Oil is found at this horizon in all parts of the field."

The phrase "in question" is used by some writers concerning matters that are not at all in question, as "The lake in question," for "The lake mentioned" or simply "This lake."

The phrases "from the standpoint of" and "from the viewpoint of" are overused by some writers, who employ them in connections where their propriety may be questioned, as, "from the standpoint of coal mining," "from the viewpoint of road building," where "coal mining" and "road building" are used for "the coal miner" and "the road builder." "From the point of view of farming" means "from the farmer's point of view"; the farmer, but not farming, may occupy a point of view. "Viewed from the standpoint of age these rocks are * * *" is a bad equivalent of "Considered as to age * * *" or, preferably, "In age these rocks are * * *."

The phrase "is responsible for" is improperly used where no responsibility is involved: "The uplift of the Ben Lomond block is responsible for this escarpment;" "An earthquake was responsible for this fault;" "A flood in the eighties was responsible for this damage."

Adverbs or adverbial phrases that by a strict definition should apply to time—such as "often" "sometimes," "at times," "always"—are by some writers used instead of words or phrases denoting place. Examples: "Pyrite is less common than marcasite, although it does occur at times, as, for instance, at the H. P. mine;" "This sandstone is usually gray but sometimes red in color;" "This rock is sometimes soft and sometimes well consolidated." The sentence "These crystals are sometimes an inch in diameter" was intended to mean "Some of these crystals are an inch [or "as much as an inch"] in diameter." The sentence "These terraces are frequently covered with gravel" was written to convey the idea that certain terraces of a group are now covered with gravel, not that frequent floods cover

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all the terraces with gravel; the idea in the writer's mind can be readily expressed by the sentence "Many of these terraces are covered with gravel." "These fissures often intersect" was written to mean "Many of these fissures intersect." "The surface is now hilly, now smooth" might with advantage have been "here hilly, there smooth." As some writers find it difficult to avoid the use of words expressing time for words expressing place or number, the subjoined list of substitutes may be helpful. It should be understood, however, that these substitutes must be used with discrimination, care being taken to select one that will convey the meaning.

Sometimes: Some of; in some places (or localities); in places; locally. *Often* or *frequently:* Many of; in many places; much of. *Frequent:* Abundant; common; numerous; many. *Occasionally:* Locally; in places; here and there; some of. *Never:* Nowhere; none of. *Always;* Invariably; everywhere.

The words "cases" and "instances" are used for 'places" or for other words, or are used superfluously. "In many cases these well records have been carelessly kept" no doubt means "Many of these well records have been carelessly kept." In the sentence "This coal has been measured in several instances," "instances" is used for "places." "Sometimes these reservoirs are lined with clay; in other cases they are unlined" is equal to the simpler statement "Some of these reservoirs are lined with clay; others are unlined." "In certain cases these sink holes have been utilized by farmers as water reservoirs" means "Some of these sink holes * * *." The following sentences, quoted from manuscripts submitted for publication, contain undesirable "instances" and "cases:" "In some cases there are instances of faults." "In no instance was the displacement greater than in this case." "Instances of gradation from one phase to the other are not common but do, in rare instances, occur." "Other cases of flowing wells are common." "Instances of similar deposits were noted in several other cases." An author who had learned to make clear, simple, direct statements would have written instead of the last sentence, "Similar deposits were noted elsewhere," or "Similar deposits were observed at other places."

A "proposition" is something proposed. The expression "a good commercial proposition" for a business venture that is likely to be profitable is newspaper slang (or "curbstone English") that should have no place in a scientific report. "The project will probably pay" is shorter and better than "The project is a good commercial proposition."

"Former" and "latter" are convenient terms that are likely to be overused. They should not be employed in a sentence that is so long and involved that the reader will have to look back to find what the words mean. As a general rule it is better to repeat the words to

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which they refer. Of course "former" and "latter" can not be used if there are more than two antecedents. By some writers these words are used unreasonably, as in the sentences "This lake, as well as Snowy Creek, drains into the Youghiogheny, *the latter carrying* [which carries] more or less drainage from adjacent farms"; "The quartz veins lie near bodies of muscovite-biotite granite, *the latter being* [which is] probably the latest rock in the region." "One of the purposes of the reconnaissance was to examine certain prospects containing ores of uranium and vanadium, and it is to *the latter* [these ores] that this report is confined." (The context shows that the phrase "the latter" means the ores of both uranium and vanadium.)

"While" is too much employed by many writers, being used for "although," "whereas," "but," or "and," as well as in its primary time sense. Where it is a simple connective, carrying no idea of contrast or concession, it can advantageously be replaced by "and" or a semicolon. Instead of "The strike is N. 40° E. while the dip is 10° NW.," write "The strike is N. 40° E.; the dip is 10° NW."

"In the vicinity of" or "in the neighborhood of" are unnecessarily used for "about" or "nearly," as in the following sentences: "The cost of production is in the vicinity of 50 per cent of the selling price"; "Its population is in the neighborhood of 1,500."

"Following" is undesirably used for "after," as in the sentences "Following this there was a second period of uplift"; "Following the completion of this work nothing further was done."

WORDS AND PHRASES TO BE DISCRIMINATED.

Terms of compass direction—as "west," "western," "westerly," "westward," "westwardly"—are by many writers used indiscriminately. "Five miles westerly from this place" is not so good as the familiar form "Five miles west of this place." The adverb "westward" means toward the west, or in a general westerly direction, the suffix "ward" having here its usual value, as in "homeward," "seaward," "skyward." In the clauses "This extends for an indefinite distance westerly" and "The stream here turns westerly" the word "westerly" may better be "westward." In like phrases some writers use undesirably not only "westerly" but "westwardly" and "to the westward," and even "toward the westward." On the other hand, in such sentences as "Clay is abundant in this formation at Newton and westward" and "The dip diminishes westward," the adverb should be replaced by "farther west" or "to the west."

A similar variety of form is seen in phrases like "the southeast [or southeastern] corner of the quadrangle." Either of the terms here given may be admissible, but it is desirable that throughout a single paper such words should be used uniformly or consistently, or

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according to some principle or method. Indefinite or general terms of broad application may perhaps end in "ern," as, "in the western part of the State"; terms of definite designation need not, as, "on the south bank of the stream," "in the northeast corner of the quadrangle."

In some manuscripts the terminations "ic" and "ical" are used indiscriminately, as "topographic, topographical"; "geologic, geological"; "petrographic, petrographical"; "paleontologic, paleontological." Uniformity is desirable in a single paper, and the prevailing tendency is toward the use of the shorter form.

By some writers "watershed" is used in the sense of "drainage basin," but as "watershed" primarily means the divide separating one drainage basin from another and is generally used with that meaning, the use of this word in two senses results in uncertainty and confusion. It is therefore suggested that "watershed" be used for the divide and "drainage basin" for the area drained. The use of "drainage" for "drainage basin" should be avoided.

"Apparently" is by some writers used for both "seemingly" and "obviously," words of opposite or widely different meaning.

"Since," generally understood as referring to time, is by some writers used where "as" would be preferable: "*Since* [As] the conditions since they were laid down." "Since" and "ago" should also be discriminated: "Since the ice uncovered the nunatak, not many decades *since* [ago]."

"Between" and "among," "each other" and "one another," "beside" and "besides," "balance" and "remainder," "economic" and "economical" may be wisely discriminated.

The adjective "due" may be misused for the participle "owing" and "owing" may be misused for "due," as in the sentences "The Whittier School was injured by the earthquake, due to the fact that the building stood on made ground"; "The injury was owing to the earthquake."

"Admit" but not "permit" may properly be followed by "of."

"Something" is used for "somewhat," as in "something more than 5 miles"; "similar" is used for "the same," as in the phrases "a similar distance," "a similar height," and "the same" for "similar," as in the sentences "The same rocks form the foot wall of the Jumbo vein, a thousand feet to the east"; "The same gravels are seen at Norwood, 2 miles farther south"; "vary" is used for "differ," as, "The wells vary in depth"; "various" is persistently misused for "numerous," "many," or "several"; "evidenced" (a word to be avoided) is used for "evinced," "shown," "indicated," or "proved."

Distinction may be made between the prepositions "in" and "into" in phrases like "comes into contact" and "lies in contact." No clear distinction can be made between "on" and "upon"; the

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tendency is toward the use of the shorter form. "By" and "with" in phrases like "was covered by ice" (agency), "is covered with ice" (condition), may perhaps be discriminated, but no general rule can be formulated for the use of these prepositions. "With" is much misused, especially for "and." Examples of its misuse are seen in the sentences "At San Marcial the average rainfall is 4.84 inches, *with a* [and the] minimum *of* [is] 1.17 inches"; "The vein has a northeast strike *with* [and] a vertical dip."

"Over" is used in many phrases where "more than" would be preferable, as it obviously would be in the sentence "This coal is under the Lee conglomerate and over 4 feet thick."

SUPERFLUOUS WORDS.

The word "found" intrudes without reason in phrases like "These rocks are found exposed at many places" and "The principal lakes found in this region." In the sentence "These lands *are known to* contain valuable deposits" the words in italic may be easily spared. "Known to be," "found to be," and "seen to be" are generally superfluous, as in the sentences "The St. Peter sandstone is *known to be* jointed in places"; "In this region the deposits are *found to be* more arenaceous." On the other hand, these phrases may be improperly omitted where they are required to complete the sense of a statement, as, "Under the microscope the grains of sand are [seen to be] completely coated with iron."

After phrases following "for instance," "for example," "such as," and like expressions "etc." is not only superfluous but improper, as in the sentences "Deposits of this type occur in several mines—for example, the Telegraph, Commercial, [and] Old Jordan, *etc.*"; "The solution contained mineralizers, such as fluorine, [and] boron, *etc.*"

Superfluous and improper words are italicized below:

"A series of parallel ridges resembling in *their* form * * *." "Throughout the *entire* area." "The problem is *a* difficult *one*." "This field is *located* 3 miles north of Bristol." "They are *both* alike." "There can be no doubt *but* that it is Cretaceous." "The steamer brings mail and freight to the *different* towns in the region." "The Survey has not *as* yet done any work in this region." (This "*as*" is a persistent intruder.)

SOME TYPICAL ERRORS.

The following literal quotations from manuscripts submitted to the Survey for publication contain some typical errors and afford examples of thoughtless and careless writing:

"These two deposits probably succeeded each other only after a lapse of time."

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"The thickness of the residual soil varies considerably, and it is at some times of no thickness whatever."

"The coast line is, with few exceptions, rocky and drops deep into the water close to the shore."

"Numerous large bowlders are abundant."

"As one goes south the land slopes downward."

"This coal bed is divided by 0 to 2 inches of bone."

"Observations covering some time were made."

"Coarse-bladed masses up to a fist in size."

"This exposure occurs shortly below Eureka."

"This is the only town of any size in the area."

"A short creek about a mile long."

"The project will cost *upwards of* [more than] a million dollars."

"Just west of the map." (For "Just west of the area mapped.")

"The great majority of the rock." (For "Most of the rock.")

"With few exceptions this township is well wooded." (For "Except in a few places this township is well wooded.")

"*A large per cent* [A large proportion, or Most] of these pebbles are well rounded."

"About 200 feet long and 3 feet *in width.*" [3 feet wide; to agree with "long."]

"The slopes of the western part of the Rio Grande region are much more varied than *they are* [those that lie] east of the river."

"The rocks have been subjected to *such* [so much] metamorphism." "This was the source of *such* [so much] trouble." "The deposit is *of such hardness* [so hard]."

"A deposit of this type is described by Fenneman from Boulder County." (For "A deposit of this type in Boulder County is described by Fenneman.") "This plain connects with that described in the Driftless Area." "A marked faceting similar to that described on the pebbles of Nantucket and Cape Cod." "Roots in situ are described 10 feet below sea level." Note also "Pyrite is not mentioned in the Erebus mine," a statement that might appropriately be headed "Keeping it dark."

"This island is rather low as to its shores" recalls to mind an old illustration of bad expression: "He was turned up as to his trousers."

GRAMMATICAL AND RHETORICAL ERRORS.

Few writers, fortunately, need to be cautioned against making statements like "Lake Superior is the largest of any lake in the United States," or "The timber in this area is the least marketable of any in the region," but as these sentences are quoted from manuscripts of Survey reports they show that errors of an elementary nature may be committed by some authors.

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The "hanging participle," another elementary error, a violation of the rule of grammar that a sentence beginning with a participle should include the substantive to which the participle relates, is common enough to justify the citation of a few bad examples: "Recognized as a bureau of information, the services of two men are required to answer questions relating to topography alone." "Going westward the dip becomes steeper." "Looking closer chatter marks were seen." "Examined carefully no fossils were observed." "Hurrying coastward the goal was soon reached." "Approaching the vein through the tunnel the serpentine is seen to be decayed." The same fault is seen in the following sentences: "Not satisfied with this result, the well was drilled deeper." "When fully explored other workable coal beds may be found here."

The phrase "and [or but] which [or who or whose]" requires a preceding relative to justify the "and." If none can be supplied the connective should be omitted and the sentence may need to be rearranged. In the sentence "This formation, a thick mass of shaly sandstone, and which preserves its character throughout the area" the "and" is redundant and improper and should be omitted, or the sentence might be written "This formation, which is a * * * and which * * *."

The "split infinitive" should be avoided unless its avoidance involves the use of awkward or unusual forms of expression. "Splitting" may exceptionally be required for clearness or for emphasis. Unnecessary and undesirable "splitting" is illustrated in the sentences "The intention was to completely explore the region," "The miners intend to fully test this ground," "It was impossible to more rapidly perform this work" [to perform this work more rapidly].

Adverbs and adverbial phrases are by some writers commonly misplaced, especially the adverb "only," which should be placed as near to the word it qualifies as the proper construction of the sentence will permit. The sentence "Their presence can only be determined by actual tests" contains a misplaced "only." Phrases beginning with prepositions also become misplaced, as, "Under such conditions it is easy to see that the commercial development of these deposits * * *." "In 1909 it is probable that this region may be reached by railway."

Verbs that should be auxiliaries are by some writers used as principal verbs, as, "The copper produced in Montana is [derived] almost entirely from the mines of Butte." These explorations were [made] for military purposes." "This work was [done] for the State Survey." Note also, "The work done was under the supervision of Thomas Brown" for "The work was done under * * *."

The use of "are" with a singular predicate and of "is" with a plural predicate is awkward: "The stony matter is largely angular

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blocks of limestone." Better: "The stony matter is made up largely of angular blocks of limestone."

The reflexive pronoun "myself" should not be used for "I" or "me:" "Long, Williams, and myself held a consultation"; "The place was named by myself."

The following sentences show undesirable transition from active to passive verbs: "These creeks flow through broad valleys until [they reach] the brink of the Clealum Valley *is reached.*" "Water absorbed at the surface percolates downward until [it reaches] the zone of saturation *is reached.*"

"The coal ranges in thickness from 0 to 6 feet" and similar phrases appear in some papers. Careful writers avoid such expressions. The sentence quoted may be rewritten: "The coal ranges from a feather edge [or "a knife-edge," or, better, perhaps, "a thin film"] to a bed 6 feet thick."

The repetition of some particular word in a sentence may be undesirable, but the attempt to avoid this well-known fault should not lead to the substitution of a synonym in a place where the word first used should be repeated, as in the sentence "Its scientific part forms the basis of its economic portion."

There is no generally accepted difference in meaning between "partly" and "partially" in the sense of "in part," but as "partially" has also the meaning "with partiality," the shorter form may be preferred.

The formation of plural nouns from adjectives, as "sedimentaries," "crystallines," "Paleozoics," "volcanics," "pyroclastics," "alluvials," is undesirable.

"Not so large a deposit" is better than "not such a large deposit." "Excepting" is, as a rule, not so good as the shorter word "except." Parenthetical phrases should be made as brief as possible.

The use of two prepositions together is awkward and as a rule unnecessary. The expression "a thickness of 2 to 4 feet" is displacing "a thickness of from 2 to 4 feet." Prepositions are doubled badly in the following sentences: "Each of the veins has been drifted on for from 50 to 70 feet." "This well was brought in in 1901." "This is equivalent to coal at at least $18 a ton."

The use of a verb plus a preposition to express an idea that may be conveyed by some other verb alone may lead to the undesirable doubling of prepositions: "This can be dispensed with with advantage" ["can be spared with advantage"]. "The conditions met with in the field" ["prevailing," "seen," or "observed"]. "A large production is not to be looked for from these gravels" ["expected"]. "Placer mining has been carried on on this stream."

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It is better not to "carry along" a singular verb to a second subject in the plural nor a plural verb to a second subject in the singular: "The region was uplifted and the streams [were] rejuvenated."

The distinction between the pronouns "which" and "that" should be borne in mind, though critics may differ as to its importance. "That" is the "restrictive" pronoun, to be used where the clause that it introduces is necessary to complete the meaning of its antecedent; "which" introduces some added or incidental information, which is not needed to complete the sense. This distinction is illustrated in the foregoing sentence. Rigid adherence, however, to this distinction need not be required. "Which" may be substituted for "that" without impropriety, though "that" can not take the place of the relative "which." As a rule the use of "that" in restrictive clauses makes the meaning clearer.

"Whose" may be used for things as well as persons, as, "The only State whose production exceeded * * *."

"Here 20 feet of sandstone is exposed" or "20 feet of sandstone are exposed" may both be defended, perhaps, but the singular form is generally used.

Care should be taken in the use of "it"; there should be no uncertainty as to the noun to which it refers, and the use of this word in two senses in the same sentence should be avoided. Some bad examples follow:

"Owing to the lapse of time between the storm and the collecting of the information it is incomplete." "The water found here, coming through the gravel beds, is cool, clear, and delicious, and the natural drainage renders it a most desirable place of residence." The inventor of a new feeding bottle for infants sent out the following among his directions for using: "When the baby is done drinking it must be unscrewed and laid in a cool place under the hydrant. If the baby does not thrive on fresh milk it should be boiled."

BAD HABITS OF EXPRESSION.

Many of the faults here critically noted are due to negligence or inadvertence, but some writers have unconsciously fallen into the habit of using, in almost any possible place or contingency, a particular word or phrase or a set of favorite words or phrases, some of which have no clearly defined meaning and may either be superfluous or usurp the places of better terms. Some of these overused and superfluous words and phrases have already been noted here, particularly "cases" and "instances." (See p. 45.) The author who writes that "Specimens in some cases show veins of calcite" does not intend to refer to specimens in cases; he means simply "Some speci-

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mens," which should be denoted clearly by two words instead of doubtfully by four. The italicized words in the following sentences are superfluous or should be replaced by the words in brackets:

"In *case of* any of these contingencies."

"The enrichment observed in the *case of the* copper veins."

"*In* most of these *cases it has been found that the* coal beds have certain peculiarities by which they may be recognized."

"In Missouri a number of *cases occur where* coal beds have a thickness of 100 feet."

"*In the case of* the solutions affecting the monzonite *they* were evidently rich in potash."

"A small amount of calcite is in *rare cases* [a few places] associated with the quartz."

"*In most cases* metamorphism is [usually] accompanied by chemical changes."

"*In the great majority* [Most] of the determinable *cases the* feldspars proved to be nearly pure albite."

"The classification was not sufficient *in all cases* to determine the status of [all] the lands."

"In other *cases* [places], as in the Sharon field of Ohio."

"The lowlands in some *cases* [places] contain lakes, the most conspicuous *instances* being Crystal, Glen, and Portage lakes."

The first of the two columns below shows sentences containing these vague or superfluous "cases" or "instances"; the second column gives interpretations in plainer English.

The fragments in a large number of cases show clear signs of glaciation.	Many of the fragments show clear signs of glaciation.
In some instances a connection is maintained with the ocean by narrow channels.	Some of the bays are still connected with the ocean by narrow channels.
The requirement of a discovery of mineral as a prerequisite to location is one that works undue hardship in the case of deep-seated deposits.	The requirement that mineral shall be discovered as a prerequisite to location works undue hardship to those who are exploiting deep-seated deposits.
As in the case of oil lands, phosphate lands are withdrawn—	Phosphate lands, like oil lands, are withdrawn—
In the case of Indian lands that are to be thrown open to settlement it is desirable to know beforehand what parts of the lands contain valuable mineral deposits.	Before Indian lands are thrown open to settlement it is desirable to know what parts of them contain valuable mineral deposits.
Grants of public land have in most cases been made through the States. In eight cases, however, grants have been made directly to corporations.	Most grants of public land have been made through the States. Eight grants, however, have been made directly to corporations.
One of the most interesting cases illustrated an instance of what appeared to be a puzzling case of vertical bedding.	One of the most interesting features of the deposit was what appeared to be a puzzling example of vertical bedding.

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"From the standpoint of" (see p. 44) and "on the basis of" also become habitual phrases, displacing better terms. "The value of the land from an agricultural standpoint" means simply "The value of the land for agriculture," or "The agricultural value of the land." In the sentence "The conclusions stated appear to be warranted on the basis of the data presented" the word "by" may be used in preference to "on the basis of." The italicized words below may with advantage be replaced by the words in brackets:

"*The rocks on the basis of* [If classified by] size of grain [the rocks] may be divided into sandstones and conglomerates."

"If the laws applicable to metalliferous lands were modified in three features they would be reasonably satisfactory *from the standpoint of* [to] the miner and *of* [to] the public."

"The external factors, such as railroad transportation and markets, may determine absolutely *from the commercial standpoint* the [commercial] workability of the coal."

A rock-cut trail, picturesque in the extreme *from the standpoint of* [in its] ruggedness and [in the] precipitous gorges and rocky slopes [it discloses].

Note also "*From a genetic point of view* [The genesis of] the coralline limestones *have* [has] been more carefully studied."

"Character," "conditions," "purposes," and like words are by some writers habitually intruded without reason into sentences in which they are superfluous or ridiculous, or both. The italicized words in the sentences below may easily be spared or may be replaced by the words in brackets.

"The surface is *of a* very uneven *character*.

"With proper drainage *conditions* the land could be made suitable for farming *purposes*."

"The deeper deposits have formed under *conditions of* high temperature and pressure."

"The flow of the stream was obstructed by ice *conditions*."

"Most of this petroleum is used for fuel *purposes*."

"*Under* [In] base-leveled *conditions* [regions] underground circulation is sluggish."

"The river here *loses its split-up character and* [is not split up but] flows in a single channel."

"Cypress trees growing in marshy *conditions* [lands]."

"*It is believed that* the [gold in the] older auriferous quartz veins *will have their valuable constituent in a* [is probably] free-milling *condition*."

The sentence "The ore is not very valuable on account of its highly siliceous character" may with advantage be rewritten "The ore is not very valuable, for it is highly siliceous," or "The ore is highly

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siliceous and is therefore not very valuable." "Tuffs of an andesitic character" probably means "andesitic tuffs," "public roads of fairly good character" no doubt means "fairly good public roads," and "stone suitable for building purposes" signifies "building stone."

Two sentences quoted on page 51 to show unnecessary and undesirable change of subject nominative, with transition from the active to the passive form, represent what may be called a persistent or fixed habit with some writers. One corrected sentence there given is "Water absorbed at the surface percolates downward until [it reaches] the zone of saturation *is reached.*" The change of subject and the introduction of the new verb in this and like sentences not only breaks the continuity of the reader's thought but weakens the sentences by putting wrong words in the place of emphasis. A few other bad examples are given below, with corrections.

"These vugs carry no gold and [do not affect] the tenor of the vein *has not been affected by them.*" "The workings were closed and *examination of them* could not be *made* [examined]." "The rocks show both bedding and cleavage but *the amount of* [not much] metamorphism *has not gone far.*" "The deposits are composed of fairly well stratified rocks but [contain many] large, irregular bowlders *are numerous.*" "Perhaps several lobes here coalesced and [formed] a continuous glacier *was formed.*" "The main vein here splits *and* [giving off] a spur vein *is given off.*"

The suggestions already made concerning the unnecessary multiplication of prepositions (p. 51) may be supplemented by a caution as to the repetition of the word "of" in a phrase like "An estimate of the cost of *the operation of* [operating] the filter." In most such phrases a noun ending in "tion" and the "of" following it should be replaced by a participle ending in "ing." Many phrases in which "of" is repeated can be rewritten with advantage. "Following the discovery of the character of this deposit" means "After the character of this deposit was discovered."

The habit of starting a sentence with phrases like "There is," "There are," and "It is" may not only multiply words but may have the effect of putting in an inferior place a subject nominative that should preferably stand at or near the beginning of the sentence. Superfluous words in the sentences below are italicized.

"*There are* many sulphide deposits in low latitudes *that* do not show enrichment."

"*It is quite certain that* material of this kind is plentiful in the region."

"*There are* [In] some places *where* the lignite beds are exposed."

"*There are* many other problems arising in this connection *that* are now only in *the transitional stage* [process] of *their* solution."

"*There has been* some faulting [occurred] subsequent to the deposition of the ore."

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"*It is believed that* these vugs probably represent openings *which were* formed by recent faulting."

"*It is the belief of* the miners [believe] that the ground now worked may be a slide."

"*There is a probability that* some of the veins may have had their gold content increased by enrichment." Better: "The gold content of some of the veins may have been increased by enrichment." (See comments on next bad example cited.)

"There is some stibnite in the ore" is not so good as "The ore contains some stibnite"; the second sentence is not only briefer than the first but more normal and more forcible; it begins with a concrete term, the proper subject, "The ore," and it ends with the term that should stand at the end of the sentence, in the place of superior emphasis.

"There is little direct evidence from outcrops of the faulting" was written to mean "The outcrops afford little direct evidence of the faulting." "There is also a difference in the grade of the valleys" was replaced with advantage by "The valleys differ also in grade," for the context showed that "grade" was the term to be emphasized.

The phrases "There are," "There were," "There have been," "It is," "It was," "It has been," and like phrases may, of course, properly and preferably begin many sentences, but not sentences of the kind just cited. Three important requisites in the construction of a good sentence are (1) the choice of the best or of a proper subject nominative, (2) the determination of its place, and (3) the selection of a proper or effective closing phrase or word. Order of statement or of arrangement is of primary importance, and related words and phrases should be kept together. Brevity is, of course, always desirable, but brevity should not be gained at the expense of clearness or correctness.

FOREIGN WORDS AND PHRASES.

Foreign words and phrases are by many writers unnecessarily used where suitable English words can be employed. Among these words and phrases are videlicet (viz), id est (i. e.), exempli gratia (e. g.), rôle, débouchure, in situ, brochure, en échelon. The following sentences can be rewritten entirely in English without disadvantage: "These oxides were carried away in toto"; "Chalcocite enrichment is practically nil." Even the often meaningless "etc." can generally be replaced by significant English, as in "The gangue consists of quartz, *etc.* [and other minerals]."

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DIRECTIONS TO TYPEWRITER OPERATORS.

Typewriter operators who are preparing matter that is to be printed should familiarize themselves with such parts of this pamphlet as are pertinent to their work. Especial attention should be given to the sections headed "The best printer's copy," "Table of contents and list of illustrations," "Tables," "Geographic names," "Hyphens in petrographic terms," "Quotations and references," "Footnotes," and "Typographic style." They should also examine recent Survey publications, noting the style of contents, footnotes, and other details, and conforming their writing to that style. A few additional hints and some repeated directions are given below.

Use ordinary letter paper (about 8 by 10½ inches), not foolscap, and leave a margin of at least an inch at the top of the page, an inch at the left, and at least half an inch at the bottom. The printers prefer that every page begin with a paragraph; therefore do not start a paragraph near the bottom of a page. Every page should be numbered. Temporary page numbers should be at the bottom.

The title of the report should appear not only on the title-page, but at the top of the first page of text, with the author's name below it, the name to be written between dashes, one above and one below, as shown on the first text page of all Survey publications. The title-page, of which two identical copies should be made (one to be used as printer's "copy" for the cover), should contain only the title of the report and the author's name, written within a vertical space of about 3 inches, at the center of the page.

In the table of contents, which should be headed "Contents," write main heads "flush"—that is, start them at the left margin of the writing; indent the others 5, 10, 15, or 20 spaces, according to their relations. Capitalize in the table of contents only such words as should be capitalized in the text. Use leaders to page numbers (see p. 8), which should be given, the pages being those on which the headings appear in the manuscript. If page numbers can not be supplied when the table of contents is written they may be inserted later.

In the list of illustrations, which should be headed "Illustrations," use short titles only. Use capital and small letters, leaders, and page numbers as in contents. In this list write "Plate" and "Figure" in full, but write these designations with the first plate and figure only. Observe and follow the style of recent printed

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Survey reports. Make a separate list for full titles, containing explanations of details.

For all headings in text use capitals and lower-case (small) letters, not capitals only, which should be used for but one heading—the title of the paper, at the top of the first page of the text. The relative rank of the headings should be shown by indention in the table of contents. (See p. 8.) It is not necessary in either contents or text to underscore or number the center headings to indicate their rank. Side headings should be underscored for italic, with period and dash after each heading. (See side headings, pp. 29–41.)

Write quoted matter or extracts of more than three lines single spaced—that is, with but half the usual space between the lines. Write all other matter double or triple spaced.

For reference marks in text use superior figures (^{1}, ^{2}, ^{3}); in tables use superior lower-case letters, underscored for italic, as $\underline{^a}$, $\underline{^b}$, $\underline{^c}$, not asterisk (*), dagger (†), etc.

Write each footnote in the line immediately below the line of text in which the reference mark occurs, separating it from the text above and below by lines running across the page; but do not break the text at the reference mark if it comes in the middle of a line.

Observe carefully that footnotes are in the forms prescribed on pages 16–18.

Follow Webster's New International Dictionary in the use of hyphens, but observe especially the rules for the use of hyphens in petrographic terms and the accompanying list of names on pages 12–14. Note also rules given on pages 21–22 for the use of hyphens.

Use a comma after the word preceding "and," "or," or other connective in a series of three or more words or phrases like "clay, sand, and gravel"; "the upper coal is 21 inches thick, the parting 12 inches, and the lower coal 18 inches." Use a semicolon before "and" if the other members of the series are separated by semicolons.

Omit the period after viz, per cent; also after numbers (1, 2, 3) that stand over columns in a table.

If a parenthetic reference to pages or illustrations is made at the end of a sentence, it should be inclosed within the sentence unless "See" is used: "Shown on the map (Pl. VI)"; "the accompanying diagram (fig. 6);" "referred to in another place (p. 72)." "The limestone is dolomized here as at some other places. (See p. 82.)" Note, however, "The reports of the *Challenger* expedition (see p. 118) contain valuable information on this point." Use "p." "Pl.," and "fig." for page, Plate, and figure in parentheses, as shown above, but write in full in text: "This is described on page 93." Note also: "Shown *in* [not *on*] Plate XVI." Use "on" only with reference to a map.

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Observe that every table and section is provided with a heading, which should be underscored for italic, and observe also that units of measurement (as feet, inches, pounds, tons) are written at heads of columns of figures representing such units. If dimensions are given in feet and inches use the form "Ft. in." for the units.

Use etc., not &c. nor et cetera.

Observe the general rules given on pages 20–21 for use of figures and of words to express numbers.

Write "half a mile," "a quarter of a mile," not "a half mile," nor "½ mile." Spell out fractions that stand alone, as "one-half," "three-fourths"; but write "3½," "1¾," where the fraction does not stand alone but is joined to a whole number.

Operators using keyboards bearing no figure 1 should use lower-case l for this numeral. If capital I is used confusion results, vol. II appearing instead of vol. 11, for example.

Write 16 by (not x) 24 inches.

Use arabic numerals except for plate numbers.

Observe the directions given on pages 19–20 in regard to capitalization and note the list of abbreviations of names of States given on page 20.

Use a. m., p. m. (not A. M., P. M.) with figures denoting clock time.

Use B. t. u. for British thermal units, c. c. for cubic centimeter, sp. gr. for specific gravity, F. for Fahrenheit, and C. for Centigrade where it is necessary to abbreviate these terms.

Write June 20 (not June 20th), but the 20th of June.

Write 2d and 3d, not 2nd and 3rd, for the abbreviations of second and third.

In copying manuscript "spell out" (that is, write in full or in words) any abbreviation or number that is encircled with pen or pencil mark, and write a "lower case" (small) letter instead of a capital letter through which a vertical or diagonal mark has been drawn.

Note carefully the following "Don'ts":

Don't capitalize any words except proper nouns or proper adjectives in text, table of contents, list of illustrations, italic side headings, or legends or titles for illustrations.

Don't use comma or period at end of line of matter that is followed or should be followed by leaders. (See sample table of contents, containing leaders, on p. 8.)

Don't begin a sentence with a figure.

Don't write one figure upon another so as to cover it and to produce an uncertain result, as a 3 upon an 8 or a 5 upon a 6. Erase fully the figure first written before correcting.

Don't use ″ for "Do." or "do.," meaning ditto. In tables use "Do." (capitalized) in first and last columns; "do." elsewhere.

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Don't use % for per cent, nor # for No.

Don't underscore foreign words for italic.

Don't underscore names of fossils when they are arranged in lists or in tables. In text underscore the name of genus and species (or genus, species, and variety), if given together, as Spirifer crispus, Spirifer crispus simplex, but not the generic, family, or other name if it stands alone, as Mollusca, Brachiopoda, Olenellus, Spirifer.

Don't underscore center headings, and don't fail to underscore side headings.

Don't put footnotes at the bottom of the page. (See p. 16.)

Don't paste sheets together except to make a table that must be wider than letter paper.

Don't write anything single spaced except literal extracts or quotations.

Don't rewrite matter for the purpose of filling a sheet with typewriting. The printer will not leave blank spaces where they may happen to occur in "copy." The rules that apply to letters in this respect need not be applied to manuscript intended for printing. The presence of erasures or of plainly written interlined words or phrases may be tolerated, and pages containing these need not be rewritten. A complicated table that has been prepared in ink need not be typewritten if the writing is plain in every part, but fine, crowded writing or pale blue prints can not be accepted. The prime requisite is that the matter should be clearly legible.

Don't crowd *anything* to economize paper. It is impossible to make "copy" too plain, and room must be left for editorial marking. This direction applies to tables and footnotes as well as to text.

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